ART. XIII.—ON CUCUMIS CITRULLUS. By BENJAMIN I. RITTER.

(*An Inaugural Essay.*)

ALTHOUGH this plant has not been made officinal in any of the Pharmacopœias, it is well known to have medicinal properties, which, by some practitioners, are considered valuable.

The seeds, particularly, have acquired considerable celebrity for their diuretic effects, and the nutritious and delightfully refrigerant qualities of the pulp, are universally known and acknowledged.

Botanical History.—The *Cucumis citrullus* belongs to the class *Monœcia*, order *Monadelphia*, L., and to the natural family *Cucurbitaceæ*, Lind.

Generic Characters.—Staminate flowers five-toothed; carolla five-cleft; filaments three; pistillate flowers, calyx and carolla like the staminate. Pistil three-cleft.

Specific description.—Plant annual, hairy; stem creeping procumbent, from ten to fifteen feet long, slender, angular, somewhat branching; tendrils also branching; leaves three to five inches in length, by two to four in width, ovate in their out-

line, generally five-lobed, sinuate, pinnatifid. Segments all obtuse; petals two to three inches long, erect. Flowers axillary, on hairy peduncles; carolla pale greenish-yellow, or ochre colored. Fruit, a melon from six inches to a foot in diameter, twelve to eighteen or twenty inches long, elliptic, subglobose, smooth, with a firm, fleshy rind. When mature, the pulp enclosed is tender, watery, saccharine, and pleasant to the taste ; of a red color generally, but frequently yellow, and sometimes white.

Observations and General History.—Merat and De Lens, in their *Dictionnaire Universel,* state that the C. *citrullus* grows in the Levant, in Egypt, and Italy, along the shores of the Mediterranean. The fruit is supposed to come to greater perfection in the vicinity of the sea. " Owing to their refrigerant quality, the melons are used in tropical climates instead of ice." " In Italy," say they, " they are sold in the market places under the name *Cocomero.*"

Tournefort states, " that in the Levant they are much esteemed, and are eaten by the natives in any quantity, without bad effect, and that they retain their agreeable coolness even when exposed to the heat of the sun.

Molina, in his work on *Chili,* says that they have a very excellent variety, with a rind as thin as paper.

In Senegal the fruit is called *Pompion,* and frequently attains the enormous weight of sixty, or even more pounds.

Habitat.—This plant is exotic, no native varieties having been found in the United States.

It has been introduced from the warmer climate of the south of Europe and Asia, and is now extensively cultivated throughout our country, particularly in New Jersey and the Carolinas, where the soil seems well suited to the habit of the plant, and the fruit comes to the greatest perfection.

Common Name—Water Melon.

The seeds being the portion used in medicine, are more particularly the subject of this essay.

Sensible Properties.—The seeds are numerous, obovate, raised at their margin, varying greatly in color from white to

brown, or even black. The kernel is white, amylaceous in its appearance, oily to the taste, resembling that of the almond. It is enclosed in a hard ligneous shell, which, when dry, is easily removed. They emit, when bruised, a peculiar pleasant odor, which is not possessed by any other portion of the plant.

As found in the shops, the seeds are depressed in the middle, showing more distinctly the characteristic rim around the margin.

They are variously colored, sometimes singularly mottled with white and brown, or black.

Seeds of several colors frequently occur in the same melon. The coloring matter, however, is confined entirely to the outer coating. The shell itself, and the nucleus, are always white.

CHEMICAL CONSTITUTION.

Although frequently used by our physicians in city, and oftener in country practice, this article is not mentioned in any of the works on Pharmacy, to which I have had access ; and, as far as I have been able to discover, there has never been an analysis made.

With a view to throw some light upon the chemical constitution of the seeds of the *Cucumis citrullus*, I have been induced to make the following experiments. The seeds used were collected when the fruit was fully ripe, and were carefully dried in the shade.

Experiment 1.—A decoction was made by boiling one ounce of the bruised seeds in a pint of water for fifteen minutes. This presented a thick milky appearance, similar to an emulsion of oil with gum. On cooling, a copious white flocculent precipitate was separated, leaving the supernatant fluid clear and of a bright yellow color. Tested with tincture of iodine, the clear decoction remained unchanged, while the precipitate gave indication of the presence of starch in large proportion.

Experiment 2.—To the filtered decoction was added a solution of sub-acetate of lead; this threw down a whitish

curdy precipitate, corresponding with the compound of
lead and gum of Berzelius.   Alcohol also threw down
gum from this decoction, and lime water changed the color to
a deep yellow.

Experiment 3.—An ethereal tincture was made, by mace
rating an ounce of the bruised seeds in four ounces of sulphuric
ether, for ninety-six hours.   Filtered and evaporated by a
sand bath, the result was one drachm of fixed oil, of a beau-
tiful yellow color, possessing the odor and saccharine taste of
the seeds.

This oil is soluble in absolute alcohol, has a specific gravi-
ty of .915, leaves a permanent greasy stain upon paper, and
when burning, gives off much sooty vapor.   The ethereal ex-
tract is of a dark brown color, consisting of oily, resinous, and
coloring matters.

Experiment 4.—One ounce of the bruised seeds was digested
in four ounces of alcohol 35° Baumé, for ninety-six hours ; fil-
tered and evaporated by a sand bath to the consistence of an ex-
tract.   This was of a dark brown color, unctuous to the touch,
slightly bitter to the taste, partially soluble in cold water, (im-
parting to that menstruum a dark orange color,) and having a
decidedly acid reaction with litmus paper.   The persulphate
of iron indicated the presence of *gallic acid*, by changing the
solution to a deep bluish-black color.

Experiment 5.—After incinerating four hundred and eighty
grains, there remained in the crucible sixty grains of grayish
black ashes.   These were lixiviated with boiling water and
the solution filtered.   The clear solution was alkaline to the
taste, and restored the color to litmus paper which had been
reddened by an acid.   Neutralized by nitric acid and evaporat-
ed, it yielded a crystalline salt resembling *nitrate of potassa.*

Experiment 6.—I treated the insoluble residue of the pre-
ceding experiment with nitric acid.   When diluted and filter-
ed, and tested with oxalate of ammonia, a slight precipitate
indicated the presence of lime in small proportion.   Ferro-
cyanate of potassa (the usual test for iron) did not indicate the
presence of that element among the constituents.

Experiment 7.—A pint of water was added to two ounces of the bruised seeds, and distilled over two-thirds. The water was slightly clouded, presenting a somewhat milky appearance; it possessed the odor and taste of the seeds, but contained no volatile oil. The residue in the retort was then strained and subjected to destructive distillation; about a drachm of a thick black viscid substance was obtained, composed entirely of gum, fecula, and coloring matter, insoluble in alcohol and ether, entirely soluble in boiling water. From the aqueous solution, the gum was precipitated by subacetate of lead, and the starch by the tincture of iodine.

The coloring matter which remained in solution was not deemed of sufficient importance for further experiment, as it was probably darkened in color by the temperature to which it was subjected.

Summary.—From the results of the foregoing experiments we may reasonably conclude that the principal constituents of the seeds of the C. *citrullus* are,—first, *gum ;* second, *starch ;* third, *resin ;* fourth, *coloring matter ;* fifth, *fixed oil* in large proportion; sixth, *salts of potassa,* and probably *lime ;* seventh, *gallic acid ;* eighth, *lignin ;* and ninth, *uncrystallizable sugar.*

AXT. XIV.—REMARKS ON TINCTURE OF KINO.
By Benjamin I. Ritter.

Soon after the introduction of the method of displacement, I made numerous experiments with the apparatus, and found it answered admirably, even better than the high estimate of its advantages had led me to expect.   In the business in which I am engaged, I have used it for more than two years for a great variety of purposes, and have never been disappointed in the result.   Nearly all tinctures may be advantageously prepared by this method.   The process will soon, I have little doubt, supersede the old plan of decoction in making aqueous solutions of active principles, as all the volatile matter may be retained, while they must unavoidably be in a great measure dissipated by the heat employed in decoction.   In this way syrup of sarsaparilla, of very superior quality, may be prepared; first, making a strong cold infusion by passing the menstruum repeatedly through the ingredients in the apparatus, then adding sugar as in any other kind of syrup.

Having frequently, in the dispensation of medicine, to make use of Tincture of Kino, I have been put to great inconvenience by not having the article in a state fit for use when prescribed by a physician.   It is well known that this tincture, made by the method directed in the Pharmacopœia, is subject to a change (after standing a short time) which renders it unfit for use.

In consolidating, its medical as well as sensible proporties become altered: it loses nearly all the astringency on which its activity, as a remedy, depends, and when allowed to stand until it granulates, it is tough, like caoutchouc, and is insoluble in water.   Under these circumstances, the only alternative is to make it in small quantity, when ordered.

This I found was a very inelegant preparation.   It was always gritty from the undissolved particles, and never clear and translucent, as it should have been.   In this stage of my difficulty I thought of the displacement principle, and imme-

diately tried it on a small scale. This answered very well; in a small instrument of my own construction, I was enabled to make a tincture, saturated with the astringent principle of the extract, in a few minutes.

This apparatus I used to my entire satisfaction, until the idea struck me that, when made on a large scale, by the same method, the tincture would be less likely to change than when the alcohol was allowed to stand two weeks on the material. I made a quantity of the tincture on the 1st of January, 1839. A considerable quantity still remains: it has not undergone the least change, is of a deep garnet color, perfectly transparent, and of a powerfully astringent taste; in short, I believe it to be just as good as it was the day it was made. In the tenth month of my experiment, an article was published in this Journal, by Mr. A. Duhamel, giving his experience on the same subject for the six months previous.

Seeing the end thus answered, (that of giving publicity to an improved process,) I concluded not to write upon the sub ject, until now that nearly another year has elapsed, without having made any change in the tincture. I consider that a publication of the facts may induce others to adopt the same course. I give the formula employed by me in making the tincture by the improved process:

$$\text{R.—Kino,} \qquad \text{ʒiij.}$$
$$\text{Alcohol,} \qquad \text{Oij.}$$

Reduce to a coarse powder, mix with an equal bulk of clean sand; then place in the filter, and pass the alcohol through it in successive portions, until it passes colorless.

I shall conclude by recommending the apparatus to all druggists who have not already adopted its use.

No apothecary should be without it. The Boullay filter (as it is called) costs no more than a common funnel, and may be applied to every purpose in which that useful instrument is employed; as a filter, it answers a better purpose than passing a turbid solution through paper, because it is less trouble, can be done in less time, and there is no breakage of filters, which so frequently occurs when paper is used. You

have only to place broken glass, straw, or cotton, in the lower part of the instrument, and cover with sand or animal charcoal; then pour on the liquid, reject the first portion that passes till it comes through clear. In this way, much time and trouble may be saved. Too much cannot be said in praise of this invention. I have now done with the subject, and hope that, as it becomes better understood, persons who make successful experiments will give them publicity, for the benefit of our profession.

June 11, 1840.

ART. XV.—NOTE ON TINCTURE OF KINO. By S. SHEPHERD.

My attention having been called to the subject of displacement by the article on that subject in the third number of the last volume, I prepared a Tincture of Kino by that process, which has given me much satisfaction. I prepared, at the same time, a small quantity of the tincture by the usual mode. In less than four weeks, the last has displayed the disposition to gelatinize, while the first is as limpid as possible. I also prepared a tincture of nux vomica by the displacement mode, which gives me entire satisfaction. I would suggest to my brethren in Pharmacy, that an advantage would result from dividing the menstruum into three parts, and returning each part several times upon the ingredients, thus ensuring the complete saturation of the two first, and being certain that the last part exhausts all the active principle.

Seventh month 1*st*, 1840.

ART. XVI.—NOTICE OF PROFESSOR KANE'S RESEARCHES
ON THE AMMONIACAL COMPOUNDS. (*Trans. Royal Irish
Academy.*)

THE action of ammonia on various salts, and the mutual de-
composition which frequently results from this reaction, has
become of much importance in the explanation of chemical
phenomena. In a former number of this journal will be found
the observations of Dumas, who was the first to conceive that
ammonia itself underwent a decomposition under certain cir-
cumstances, and that the result was the production of amido-
gen, a hypothetical compound, containing one equivalent less of
hydrogen than the body from which it was derived. Farther
research has led to a more extensive application of these views,
so as greatly to increase the probability of the correctness of
the theory, and to render it necessary that several compounds
formed by the action of ammonia, should be considered in a new
light, and with different ideas as to their composition. To il-
lustrate this subject to a greater extent, we have taken ad-
vantage of Professor Kane's labors, as the most extensive,
and, in reviewing his researches, we shall avail ourselves
of any observation of others tending to illustrate the same
point.

From the alkaline nature of ammonia, the *a priori* conclu-
sion would be, that its action would be analogous to that of
bodies of similar character; but, in point of fact, while in some
instances this analogy is fully borne out, there are others in
which it exhibits the utmost difference ; and of this its action
on corrosive sublimate forms a very striking example, which
has long attracted the attention of chemists. When ammonia
is added to a solution of corrosive sublimate, a white powder,
known as a white precipitate, is formed, and the solution con-
sists entirely of muriate of ammonia. To explain this reac-
tion, we may suppose either that ammonia enters undecom-
posed into the new salt and forms a double muriate of ammo-

nia and mercury, or that, being decomposed, amidogen unites
with a portion of the mercury, and forms an amidet of mercu-
ry, which unites with the chloride already present, to produce
the white precipitate.   The following formula will show these
two modes of decomposition ; but in the former instance it is
necessary to consider the water present as taking part in the
decomposition, while in the latter it may be entirely neg-
lected.

$$2Cl^2Hg+4NH^3+4HO=2(ClH,NH^3)+2(ClH,HgO^2,NH^3)$$
$$2Cl^2Hg+4NH^3\qquad=2(ClH,NH^3)+(Cl^2Hg+Hg2NH^2)$$
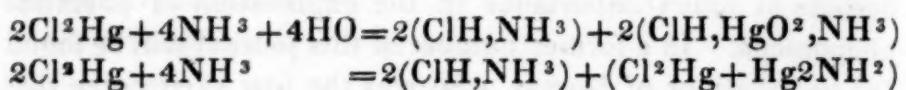
In the first, four equivalents of ammonia, and four equiva-
lents of water, acting on two equivalents of bichloride of mer-
cury, there results two equivalents of muriate of ammonia and
two equivalents of muriate of ammonia and deutoxide of mercu-
ry ; and in the second, omitting the water, we have the two
equivalents of bichloride and the four equivalents of ammo-
nia mutually reacting with decomposition of half of each, two
equivalents of the chlorine of the bichloride uniting with two
equivalents of the hydrogen of the ammonia, to form hydro-
chloric acid, which unites with the remainder of the ammonia
to form the muriate of ammonia, and there is left one equiva-
lent of undecomposed bichloride of mercury and one equivalent
of metallic mercury, with two equivalents of amidogen, to
unite and form the biamidet of mercury.

To ascertain to which of these views we should give cre-
dence, it is necessary to resort to the results of analysis.
Here we are at once met by the discrepant statements which
are given by the different chemists who have examined this
preparation,—the mercury varying from 74 to 82 per cent.,
and the chlorine and ammonia in like proportion.   To account
for this, it is only necessary to consider how readily the salt
is decomposed by hot water, and even by cold water, when
used in large quantity,—also that as two methods are usually
directed to obtain this preparation, the results of which are
somewhat different in composition, the substance analysed
would necessarily afford different proportional results.

Professor Kane in the preparation of this article for analysis, appears to have exercised every requisite caution to obtain a preparation which should give accurate results.   The process adopted was to add to a cold solution of bichloride of mercury, a slight excess of water of ammonia ; the whole was then thrown on a filter, and the liquor allowed to drain away as much as possible ; then distilled water was poured over the precipitate, so as to remove entirely the whole of the original liquor, the use of any excess being carefully avoided, lest any decomposition should be produced, a fact which would be evinced by the injury of the pure milk white color of the precipitate.

The preparation thus obtained is perfectly white, and is insoluble in water without decomposition.   When washed with a large quantity of cold, or a smaller quantity of hot water, or boiled in this liquid for a few moments, it is decomposed, and a heavy powder, of a canary yellow color results, which, when dry, presents a granular appearance.   If potassa or soda be added to the liquid and boiled, the same decomposition results, the products being the same as when water is used, the purity of the yellow color alone being injured by the use of the alkali. When the alkali itself is mixed with the white precipitate, the same yellow color is produced, and ammonia is disengaged, but not more than one half of the ammonia can be liberated by this alkali.   White precipitate dissolves readily in nitric and hydrochloric acids, from which solutions it is not again precipitated by the addition of ammonia.   These same solutions are probably formed when nitrate or hydrochlorate of ammonia is digested on the peroxide of mercury, when, according to the experiments of Messrs. Brett and Thompson, solution of the oxide takes place with the disengagement of ammonia. From the solution in hydrochloric acid, the iodide of potassium throws down a red powder, which is the periodide of mercury, and the sulphuret of barium, a black precipitate of the persulphuret of mercury, while, in the former instance, the hydrochlorate of ammonia and chloride of potassium remains in solution.   A similar reaction takes place when the solutions

of the same salts are added to the dry white precipitate, only all the ammonia is now liberated, and the liquor contains chloride of potassium and free potassa. When white precipi. tate is heated to a temperature below a red heat, in a tube closed at one end, it is decomposed ; calomel sublimes and ammonia, and nitrogen is given off, together with watery vapor.

Having, by careful preparation, obtained an article upon which reliance could be placed, Prof. Kane trusted to diminish the errors of analysis by taking the average of numerous results, these results being obtained by processes differing in principle, thus avoiding any liability of the same error pervading the whole.

As when ammonia is added to a solution of bichloride of mercury, the whole of the mercury is precipitated, hydrochlorate of ammonia remaining in solution, it is evident that knowing the quantity of mercury contained in the bichloride used, and ascertaining the amount of chlorine abstracted by the ammonia and held in solution, the whole of the mercury, and the residue of the chlorine, will be the amount of these two substances in the precipitate obtained, the weight of which is to be ascertained when perfectly dry.

Taking, therefore, 100 grains of bichloride, which contains 74.09 of mercury, the average result of five different experiments gave,

Precipitate.	Chlorine.	Mercury.
93.1	12.91	74.09

Or 100 parts of the precipitate contains

Ch	13.87
Hg	79.57
Leaving a deficit of	6.56
	100.00

to be accounted for as oxygen and ammonia, or as amidogen.

The decomposition of the white precipitate by heat, affords another mode of determining the amount of the ingredients

entering into its composition. For, as the products are calomel, ammonia, nitrogen, and watery vapor, we have all the data necessary for the purpose ; the calomel giving the amount of chlorine and mercury, while the ammonia, nitrogen, and water will give the ammonia and oxygen, or the amidogen and water, entering into its composition. The result of 4 experiments gave, as a mean,

Calomel, 92.98 or Hg	79.14
Cl	13.84
NH^3	3.87
N	2.19
HO	.58
Loss	.38
	100

The value of the mercury may also be obtained by the pro cess of reduction, the solution in hydrochloric acid being acted on by protochloride of tin, and the resulting mercury weighed. The mean of two experiments gave,

Hg   77.7 per cent.

The decomposition of the hydrochloric solution, by sulphuretted hydrogen, afforded also results by which the amount of mercury and ammonia could be estimated. The resulting precipitate of bisulphuret being carefully dried and weighed, and the solution from which it was deposited being evaporated to dryness, and the hydrochlorate of ammonia weighed, gave data from which it was estimated that 100 parts of ,the precipitate yielded

Hg	77.96
NH^3	7.06

Heating white precipitate with a solution of sulphuret of barium, and passing the resulting vapor of water and the ammonia into a dilute solution of hydrochloric acid, a solution of

muriate of ammonia was procured, from which the ammonia was estimated at 6.72 per cent.

The same process, substituting iodide of potassium for the sulphuret, gave the ammonia as 6.33.

In all the theories previously advanced, oxygen is enumerated as one of the ingredients in white precipitate, in sufficient amount to peroxidize the whole of the mercury. According to the results of the decomposition by heat, the only product in which the oxygen is to be found is the aqueous vapor, which, if this element be present, should result from its union with the hydrogen of the ammonia, and thus liberating nitrogen, which is also one of the products. To ascertain the amount of this vapor, a desiccating tube, sometimes containing lime, at others potassa, was attached to the apparatus used in this decomposition, its increase of weight denoting the amount of water retained. The results of four experiments, in the last of which no perceptible increase of the desiccating tube could be perceived, gave, as a mean, 0.583 per cent. of water, an amount so small as to afford strong presumption that it was derived from an imperfect drying of the precipitate. The average of the ammonia derived from the same experiments, the nitrogen being previously converted into ammonia and added to the amount of that alkali obtained, was 6.61 per cent.

Summing up the results of these various operations, and taking the mean of the whole, the composition of white precipitate will be

$$
\begin{array}{ll}
\text{Hg} & 78.60 \\
\text{Cl} & 13.85 \\
\text{NH}^3 & 6.77 \\
\left.\begin{array}{l} \text{HO} \\ \text{O} \end{array}\right\} \text{loss} & 0.78 \\
\hline
& 100.00
\end{array}
$$

From which the following formula may be deduced :

$$\text{Hg} + \text{Cl} + \text{NH}^3$$
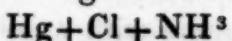
Omitting the water as too small to constitute one of the constituents of the compound.

This result differs in giving the amount of mercury and chlorine at a higher estimate than that derived from the results obtained by other chemists, with the exception of Guibourt, whose analysis on these points agrees remarkably with the above, but varies in making the ammonia about one-half the quantity, the balance being estimated as oxygen. This result was probably due to the mode of analysis adopted by Guibourt, based on the supposition that potassa liberated all the ammonia from the precipitate, the loss being supposed to be oxygen. But Prof. Kane has shown that only one-half of the ammonia is thus liberated, and that an analysis conducted in this way necessarily leads to this erroneous result from the inability of potassa to produce complete decomposition.

The above formula does not, however, explain the phenomena resulting from the action of heat upon white precipitate, for a substance composed as above, should yield calomel and ammonia, not calomel, ammonia and nitrogen, when exposed to heat.

Dumas' researches has led to the probability that, in oxamide, benzamide, &c., there exists a body composed of NH^2, capable of combining with other bodies, as, for example, the bases of oxides, in the same manner as chlorine and cyanogen do. Considering, then, that this body is combined with one-half of the metallic mercury in the precipitate, while the other half is combined with the chlorine, there will result the bichloride of mercury on the one hand, and the biamidet of mercury on the other, by their union constituting the white precipitate, the formula for which would be

$$HgCl^2 + Hg2NH^2$$
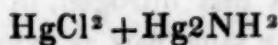
The examination of this formula will afford a very simple explanation of the effects of heat on this compound ; for, if three equivalents are considered to have undergone decomposition, there will be six equivalents of chlorine and six of mercury, to form the chloride of mercury, and twelve equivalents

of hydrogen to combine with four of nitrogen, to form am-
monia, while the remainder of the nitrogen comes over in a
free state.

If the experiments to ascertain the amount of oxygen in the
compound are satisfactory as to its non-existence, then the re-
sult of the decomposition, effected by iodide of potassium, will
afford additional evidence of the correctness of this formula ;
for, while the iodine unites with the mercury to form the per-
oxide, and the chlorine with part of the potassium, the decom-
position of water becomes necessary to account for the con-
version of the remainder into the free potassa which exists in
the solution, and hence will be derived the hydrogen necessa-
ry to form the ammonia from the amidogen.

The fact of the absence of oxygen from the compound, has
been verified by M. Ullgren,* who has also substantiated the
composition of white precipitate, as advanced by Prof. Kane.
M. U. is satisfied that when this substance, perfectly dry, is
heated gradually to fusion, and then treated with perfectly dry
hydrochloric acid gas, no water is formed, but there results a
liquid mixture of chloride of mercury and sal ammoniac.

These considerations would seem clearly to point out the
existence of nitrogen and hydrogen in this and analogous com-
pounds, but there is yet another view which has been taken,
in which part of the nitrogen is supposed to be directly com-
bined with the metal, and the remainder to unite with the hy-
drogen and constitute one of the elements of the compound
under the form of ammonia, or that the amidets are nitrurets
combined with ammonia.   M. Mellon, who has advanced
these views, considers that nitrogen, in ternary combination
with a metal, plays the same part as oxygen, sulphur, &c., and
forms azo-salts, as the others do oxy-salts, sulpho-salts, &c.
This view will certainly explain the composition of these
bodies, but with much less simplicity than the theory of the
amidets.

* Ann. der Pharm., t. 27.

The action of water on white precipitate affords another compound of chloride and amidet of mercury, but in which the elements vary in their proportion, part being replaced by oxygen ; this compound, which is of a canary yellow color, has usually been considered as the peroxide of mercury, arising from the total decomposition of the white powder. But it will be seen, that in composition it is allied to the substance from which it is derived.   This is a heavy yellow granular powder, which dries readily, and is very slightly soluble in water ; it is not affected by the alkalies.   When heated, it yields calomel, metallic mercury, ammonia, azote, and water.

The analysis of this substance was conducted on the same principles as the former, and from the result, Prof. Kane deduces the composition to be

Hg	85.72
Cl	7.48
NH^2	3.42
O	3.38
	100.00

" This yellow powder is generated, evidently, by the reaction of water on white precipitate, in which one-half the chlorine and ammonia are converted into sal-ammoniac, a corresponding portion of the mercury being oxidised."

Prof. Kane was unable to procure the ammoniuret of mercury by the action of alkalies in excess on white precipitate ; the result was always the production of the yellow powder above mentioned.

The action which ammonia exercises on calomel is similar to that on corrosive sublimate.   When ammonia is added to calomel, a powder is formed, which, when moist, has a black color, but when dry is gray.   This powder has been stated to be the black oxide of mercury, but the experiments of Prof. Kane exhibit a different result.   This powder is not altered by exposure to air, or to the temperature of 180° F.; boiling water does not affect it ; a high temperature decomposes it,

and there is given off calomel, metallic mercury, ammonia, azote, and a trace of water.

The processes for analysing this body were the same as for white precipitate; it will be sufficient, therefore, to indicate each process and their results without entering into details.

From its mode of preparation was derived the following results:

Hg	88.91
Cl	7.95
Other matters	3.14
	100.00

By protochloride of tin,

Hg	88.18

By hydrochloric acid and sulphuretted hydrogen,

Hg	87.90

By iodide of potassium,

NH^3	3.36

The mean of these experiments give

Hg	88.33
Cl	7.95
NH^3	3.36
Loss, &c.	.36
	100.00

This body then is analogous to white precipitate, the mercury being in proto-combination, and we may construct two formulæ for its composition, according as we consider ammonia or amidogen as one of its elements. The same reasons to guide our choice will apply equally to this body as to white precipitate. Under the former view there will be

$$Cl.Hg + HgO.NH^3$$

Under the latter,

$$Cl.Hg + HgNH^2$$
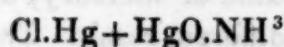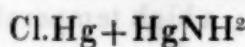
Calomel, by the action of ammonia, should yield 97.84 per cent. of the product, having the former composition, while it should give but 95.95 per cent. of the latter.   The experimental results on this point favor the latter view, as 100 parts of calomel yielded 95.72 as an average of two trials.

Other mercurial compounds, as the peroxide, sulphate, nitrate, &c., have been examined with regard to the action of ammonia, and the nature of resulting compounds, and, in many of them, there has been found reason to suppose that amidogen enters as a constituent.   In like manner the salts of silver, copper, and zinc have also been embraced in this examination, and the following are some of the conclusions at which Prof. Kane arrives:

Ammonia is an amidet of hydrogen, and should have the following formula.

$$NH^2.H$$
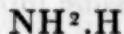
Amidogen may combine with metals, and the metallic amidets have a singular tendency to combine with chlorides and oxide of the same metals, of which the mercurial and cupreous salts afford some remarkable examples.

It may be proper to state (on the authority of Fauché and Soubeiran,* the original not being accessible) that Prof. Kane considers the precipitate of Wohler, (the white precipitate of most of the Pharmacopœias,) prepared by the action of carbonate of potassa, on mixed solutions of sal-ammonia and corrosive sublimate not to be identical in composition with that formed from corrosive sublimate by ammomia, but that it may be considered as formed of one atom of ammonia, and one atom of corrosive sublimate.   Its formula would then be

$$HgCl^2 + NH^3$$
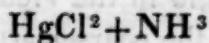
He also, states that it may be formed by boiling white precipitate in water of ammonia.   R. B.

* Journ. de Pharm. Jan. 1840.

ART. XVII.—DESCRIPTION AND ANALYSIS OF A MINERAL
A SALINE INCRUSTATION, AND A BARK, BROUGHT
FROM THE COUNTRY LYING BETWEEN SANTA FE, AND
THE HEAD WATERS OF THE ARKANSAS RIVER.

By WILLIAM PROCTER, JR.

THE three substances which form the subjects of this essay
were brought to this city by J. Gregg, an intelligent gentle-
man who trades with Santa Fé, in Mexico. The specimens
severally were accompanied by an outline of their locality,
etc., which has been inserted previous to each description.*

It would add greatly to our knowledge of the productions
and resources of that section of country, as well as of other
parts of the far west, if the same interest was manifested by
all those who are engaged in the western trade beyond the
Mississippi.

The following remarks were attached to the mineral, viz:

"This mineral is found in inexhaustible quantities on both
sides of the Canadian fork of the Arkansas river, about three
hundred miles above its junction with the latter. I have seen
several huge solid rocks of it, containing several thousands of
cubic feet each; and, indeed, along the waters of the Cana-
dian, for many miles, there is no other rock. The hills are
covered, the vallies are strewed, and the rivulets are lined
with it. It occurs of various qualities from the coarse appear-
ance of ordinary plaster of Paris, to the glittering gypsum (se-
lenite.) The latter is found, composed of thin laminæ, which
may be slit into sheets.

The same quality, found in the vicinity of Santa Fé, is used
for window panes; and the coarser article (also found there,)
burnt, makes a beautiful white-wash, which is also used by the
Mexicans."

* It is due to Alexander Fullerton, Jr., druggist of this city, to state that
it was through his instrumentality that the substances above treated of
were obtained from his friend J. Gregg.

Description.—The mineral varied in aspect, in different pieces ; most of it was white, with a slight tint of red, of a granular texture, appearing through the glass, a mass of glittering grains, without taste, yielding to the finger nail, and, in short, had all the appearances of the *granular gypsum* of mineralogists. Other portions had a stratified, somewhat crystalline texture, and a grayish white clouded color. The specific gravity of the former was 2.233, that of the latter was 2.222.

Analysis.—One drachm of the mineral was boiled with six ounces of water, acidulated with sulphuric acid, until twenty-six grains had been dissolved, and the liquor filtered while hot. To the hot filtered solution, oxalate of ammonia was added, until a precipitate ceased to be produced. This precipitate, when collected, washed and dried, weighed twenty grains, and was then heated to redness. The resulting powder dissolved readily in nitric acid with effervescence, and possessed the characters of carbonate of lime.

Twenty grains of oxalate of lime is equivalent to 8.8 of lime which, united with one equivalent of sulphuric acid, makes 21.1 grains of anhydrous sulphate of lime, which is very near the quantity that exists in twenty-six grains of the hydrous sulphate.

A portion of the mineral was boiled in water (which dissolved a small quantity,) and the solution filtered. When chloride of barium was added, a dense precipitate resulted, which had the characters of sulphate of baryta, and consequently proving the existence of sulphuric acid in the mineral.

To render the evidence in favor of the mineral being sulphate of lime, a portion of it was powdered and calcined, by which operation it lost weight and bulk, and acquired the property of solidifying by the addition of a proper quantum of water, peculiar to the sulphate of lime, or plaster of Paris.

Hence there can be little doubt that the mineral is granular gypsum. Existing in such vast quantities as has been represented, this mineral production will doubtless at some future

period be of immense advantage to that portion of the country in an agricultural point of view.

THE SALT.

The following observations accompanied the saline matter, viz. : "This species of salt was taken from a pond, near *El Paso del Norte*, in the department of Chihuahua. This pond spreads over two or three acres of ground. During the wet season the water only is strongly impregnated with the salt ; but when dry weather comes on, it crystallizes on the surface of the water, and presents the appearance of a pond of limpid ice. When a hatchet is struck into it, it chips out with about the same facility and brittleness as that substance. In some parts of the pond it is found crystallized to the depth of five or six inches. I have heard it said that the natives sometimes use it as a purgative. Many of these ponds or lakes occur on the route to the Rocky Mountains, but none of them are so highly impregnated with the salt as the one from which the specimen was obtained."

Description.—The specimen, as presented to view, was a white powder, having all the appearance of an effloresced salt; a saline disagreeable taste, without odor, and completely and readily soluble in water, except about one per cent. of impurities.

When the solution is evaporated till a pellicle forms, it becomes nearly a solid mass of prismatic crystals by cooling. When the mother waters are suffered to drain off, and evaporated, more crystals are obtained.

Twenty-eight grains of the crystallized salt was subjected to a gentle heat, until deprived of its water of crystallization, and yielded 12.5 grains of anhydrous salt. This was dissolved in water and treated with solution of chloride of barium, until a precipitate ceased to be produced. This precipitate, when collected on a filter, washed till the water that passed remained unaffected by nitrate of silver, dried and weighed, amounted

to twenty grains. The *sulphuric acid* thus separated amounts to 6.86 grains.

It hence follows that the salt is a *sulphate*, and it remained to ascertain the base.

Chloride of platinum had no effect upon a concentrated solution of the salt, and consequently the base is not potassa.

When a strong solution of potassa was added to the solution, no ammoniacal odor was emitted.

When a small portion of the salt is held in the outer flame of the blow-pipe, it communicates a deep yellow hue to the flame, which is characteristic of soda ; hence the salt must be *sulphate of soda.*

If a sulphate of soda, 6.86 grains of sulphuric acid, require 5.38 grains of soda for saturation, then $6.86 + 5.38 = 12.24$ grs. of sulphate of soda, while the amount of salt employed was 12.5. Sixty grains of the impure anhydrous salt was dissolved in water and filtered, to separate the impurities. By treating the solution with oxalate of ammonia, about one per cent. of oxalate of lime was obtained, equal to about .044 of lime.

The mother waters remaining after crystallizing the sulphate of soda, were suffered to evaporate to one-fifth, and the remainig fluid allowed to drain off. The crystalline matter which resulted consisted of sulphate of soda, interspersed with small cubic crystals.   A number of the cubes were separated.

When the cubic salt was added to a drop of concentrated sulphuric acid, and a glass rod moistened with ammonia held over it, copious white vapors resulted.

Another portion was dissolved in water, nitrate of baryta added to separate any adhering sulphate, and the liquor filtered. When nitrate of silver was added to the solution, a white precipitate resulted which was soluble in ammonia. The crystals also decrepitate by heat, and tinge flame yellow, and are hence *chloride of sodium.*

The liquid drained off in the last experiment was mixed with alcohol, and nitrate of baryta added to get rid of the sulphuric acid—of the sulphate, then filtered and evaporated to dryness—the dry mass digested in alcohol, and the solution

filtered and evaporated to dryness. The resulting saline matter was redissolved in water, and divided into two portions; to one, nitrate of silver, and to the other, oxalate of ammonia was added, producing in both cases bulky white precipitates, evidencing in the first case the existence of *hydrochloric acid*, and in the other *lime*. Hence the salt is a *chloride of calcium* or hydrochlorate of lime in solution.

In conclusion, the saline matter, as obtained from the natural locality, consisted of about ninety-seven per cent. of sulphate of soda, two per cent. of the chlorides of calcium and sodium, and one per cent. of impurities.

THE BARK.

It now remains for us to examine the bark, previous to which, however, let our friend speak for himself, as to its locality, etc. "The tree which yields the bark is called by the Mexicans, *alamo*, (this name, however, which means poplar, is applied by them to every species of cottonwood,) and by Americans, *mountain* or *willow-leaved* cottonwood. It resembles the Mississippi cottonwood, in the external appearance of the bark and the internal qualities of the wood; but the leaf is long and slender like that of the common willow; thus, in this respect, differing materially from the Mississippi tree. The flower I do not recollect, but it produces a cotton similar to that of the common cottonwood. The bark is said to possess, in a *high degree*, the qualities of the Peruvian bark. Its growth seems confined to the vicinity of water, being found only on the border of rivulets, and the ravines of the mountains. I have seen it no where but in the mountains of Santa Fé, but it most probably extends through all that spur of the Rocky Mountains. I have seen the trees as large as two or three feet in diameter."

Description.—The bark, as presented, was in pieces five or six inches long, of a light yellow color, and was evidently the inner bark. It possessed a very considerable bitterness, with an after taste which reminds one of the common poplar.

Analysis.—An ounce of the bark was boiled in half a pint of water for an hour. To the decoction thus formed, sub-acetate of lead was added, until it ceased to cause a precipitate, and the liquor separated by a filter. This was then boiled with an excess of chalk, to precipitate the oxide of lead, and the liquor again separated by filtration. It was then evaporated to one-tenth and allowed to remain at rest. Numerous crystals were gradually deposited as the liquor concentrated by spontaneous evaporation. These were redissolved in water and boiled with purified animal charcoal, the solution filtered, and again evaporated and crystallized. The substance thus obtained was white, had a very bitter and peculiar taste, crystallized in flattened rectangular prisms, soluble in water and alcohol, much more so by heat, but insoluble in ether. When put in contact with concentrated sulphuric acid, it is immediately turned red, which color it communicates to the acid. It is neutral to litmus paper.

The mother water was treated with carbonate of potassa, and the precipitate thus formed, by boiling water, and the water partially evaporated, suffered to cool, but no evidence of populin was obtained. The precipitate was carbonate of lime, resulting from the decomposition of the acetate of lime, by the carbonate of potassa.

When the crystalline matter above mentioned was treated with oxalate of ammonia, no evidence of lime was manifested. These properties are evidently those of salicin, as mentioned by Leroux, its discoverer ; and this principle has already been found in the bark of the *Populus tremulus*, of Europe, by Braconnot. Captain Bonneville says the *bitter cottonwood* and *willow* grow promiscuously on the Rocky Mountains. (Irving's Rocky Mountains.) May not the bark under consideration be the product of a species of *salix?* It has been ascertained that the bark of several species of that genus contain salicin, but no populin, which is the case with that which forms the subject of these remarks.

As has been said, subacetate of lead causes a copious precipitate.

By adding a solution of gelatin to the decoction, a precipitate was obtained, having the characters of tanno-gelatin.

Persulphate of iron causes a dark greenish blue precipitate with the decoction.

Tincture of iodine has no effect on the decoction.

A portion of the bark was macerated in alcohol 36°, for three days.   The tincture thus formed, when added to water, caused no precipitate or cloudiness.

To the bark remaining after the alcoholic maceration, ether was added, and permitted to stand two days.   The ethereal liquor, when evaporated, yielded a small portion of fixed oil of a deep yellow color.   When the alcoholic extract is treated with ether, and the ether evaporated, a small quantity of the same fixed oil is obtained, proving the solubility of this oil in alcohol.   From the foregoing observations we may infer that this bark contains salicin, tannin, gum, and fixed oil.   Its power as a febrifuge is undoubtedly due to *salicin,* of which it contains about two per cent.

ART. XVIII.—NOTICE FROM DR. ROBERT HARE, PROFESSOR OF CHEMISTRY, &c., RESPECTING A NEW LIQUID HYPO-NITROUS ETHER, AND AN ETHEREAL GAS: ALSO A SERIES OF GASEOUS COMPOUNDS FORMED WITH THE ELEMENTS OF WATER, WHEN IN THE ACT OF COMBINING EXPLOSIVELY.

WHEN nitric acid or sulphuric acid with a nitrate is employed to generate ether, there must be an excess of two atoms of oxygen for each atom of the hyponitrous acid which enters into combination. This excess involves not only the consumption of a large proportion of alcohol, but also gives rise to several acids, and to some impurities.

It occurred to me that for the production of pure hyponitrous ether, a hyponitrite should be used. The result has fully realized my expectations.

By subjecting hyponitrite of potassa or soda* to alcohol and diluted sulphuric acid, I have obtained a species of ether which differs from that usually known as nitrous or nitric ether in being sweeter to the taste, more bland to the smell, and more volatile. It boils below 65° of F., and produces by its spontaneous evaporation a temperature of 15° F. On contact with the finger or tongue, it hisses as water does with red hot iron. After being made to boil, if allowed to stand for some time at a temperature below its boiling point, ebullition may be renewed in it apparently at a temperature lower than that at which it had ceased. Possibly this apparent ebullition arises from the partial resolution of the liquid into an aeriform ethereal fluid, which escapes, both during the distillation of the liquid ether, and after it has ceased, even at a temperature

---

* The hyponitrites of potash and soda which were employed in the process above mentioned, were extricated from the saline mass which remains after heating a nitrate of either of those bases, to obtain oxygen, so long as this gas does not contain more than three per cent. of impurity. This residual mass has been found, to Dr. Hare's surprise, to consist of about two-thirds nitrate and one-third of hyponitrite. This latter being more soluble, may be separated by crystallization.

below freezing. This aeriform product has been found partially condensible by pressure, into a yellow liquid, the vapor of which, when allowed to enter the mouth or nose, produced an impression like that of the liquid ether. I conjecture that it consists of nitric oxide, so united to a portion of the ether as to prevent the wonted reaction of this gas with atmospheric oxygen. Hence it does not produce red fumes on being mingled with air.

Towards the end of the ordinary process for the evolution of the sweet spirits of nitre, a volatile acrid liquid is created, which affects the eyes and nose like mustard, or horse radish.

When the new ether as it first condenses is distilled from quick lime, this earth becomes imbued with an essential oil which it yields to hydric ether, when aided by the presence of water. This oil may be afterwards isolated by the spontaneous evaporation of its solvent. It has a mixed odor, partly agreeable, partly unpleasant. From the affinity between its odor and that of common nitrous ether, I infer that it is one of the impurities which exist in that compound.

The new ether is obtained in the highest degree of purity, though in less quantity, by introducing the materials into a strong well ground stoppered bottle, refrigerated by snow and salt.*   After some time the ether will form a supernatant stratum, which may be separated by decantation.

---

* The following is the proportion in which the materials may be employed :

Sulphuric acid 7 ounces 332 grains avoirdupois.
Water same bulk as the acid.
Alcohol 3 ounces 234 grains.
Hyponitrite of soda 14 ounces 204 grains.

When the distillatory process is resorted to, the alcohol and salt is first introduced, the diluted acid being gradually poured into the retort by means of a tapering glass tube passing through the tubulure, to which it is luted. The lower orifice of the tube descends below the surface of the alcohol. The more volatile portion of the ether comes over without heat; a considerable portion may afterwards be distilled by raising the temperature by a water-bath. The ether thus obtained should be redistilled from powdered quick lime.

Any acid, having a stronger affinity for the alkaline base than the hyponitrous acid, will answer to generate this ether. Acetic acid not only extricates, but appears to combine with it, forming apparently a hyponitro-acetic ether.

I observed some years ago that when olefiant gas is inflamed with an inadequate supply of oxygen, carbon is deposited, while the resulting gas occupies double the space of the mixture before explosion. Of this I conceive I have discovered the explanation. By a great number of experiments, perforemd with the aid of my barometer gage Eudiometer, I have ascertained that if during the explosion of the gaseous elements of water any gaseous or volatile inflammable matter be present, instead of condensing there will be a permanent gas formed by the union of the nascent water with the inflammable matter. Thus two volumes of oxygen, with four of hydrogen, and one of olefiant gas, gave six volumes of permanent gas, which burns and smells like light carburetted hydrogen. The same quantity of the pure hydrogen and oxygen with half a volume of hydric ether, gives on the average the same residue. One volume of the new hyponitrous ether under like circumstances produced five volumes of gas.

An analogous product is obtained when the same aqueous elements are inflamed in the presence of an essential oil. With oil of turpentine a gas was obtained weighing per hundred cubic inches $16\frac{5}{10}$ grains, which is nearly the gravity of light carburetted hydrogen. The gas obtained from olefiant gas, or from ether, weighed on the average, per the same bulk, $13\frac{5}{10}$ grains. The olefiant gas which I used weighed per hundred cubic inches only $30\frac{5}{10}$ grains. Of course if, per se, expanded into six volumes, it could have weighed only one-sixth of that weight, or little over five grains per hundred cubic inches. There can therefore be no doubt that the gas obtained by the means in question, is chiefly constituted of water, or of its elements in the same proportion of two volumes of hydrogen to one of oxygen.

With a volume of the new ether, six volumes of the mixture of hydrogen and oxygen give on the average about five

residual volumes. The gas created in either of the modes above mentioned does not contain carbonic acid, and when generated from olefiant gas, appears by analysis to yield the same quantity of carbon and hydrogen as that gas affords before expansion.

These facts point out a source of error in experiments for analyzing gaseous mixtures by ignition with oxygen or hydrogen, in which the consequent condensation is appealed to as a basis for an estimate. It appears that the resulting water may form new products with certain volatilizable substances which may be present.

ART. XIX.—ON THE USE OF LACTATE OF IRON.
By MM. Gelis and Conté.

(Report made on this paper to the Academy of Medicine, by MM. Fouquier, Bally and Bouillaud.

The Academy of Medicine, at its meeting on the 4th of February last, received a report from MM. Bally, Fouquier and Bouillaud upon a paper of MM. Gelis and Conté, having for its subject the Lactate of Iron, and its properties as a therapeutic agent ; we propose to present here an account of this paper and the report upon it.

MM. Gelis and Conté first pass in review the ferruginous preparations employed in medicine ; there are none, in their opinion, even among the most recent and best accredited, but leave much to be desired. The lactate of the protoxide of iron appears to them to possess a superiority over every other preparation, and this they endeavor to establish by the following considerations :

All modern authors who have attended to the ferruginous preparations, and the forms under which they can be administered, propose for their object to present the iron in such a

state that it may readily be attacked by the acids of the gastric juice.   But the labors of MM. Berzelius, Tiedman and Gemelin, Dumas, Leuret, and Lassaigne, have shown that the gastric juice contains lactic acid in so great a proportion, that to its presence may be attributed the very energetic solvant property of this juice, which does not appear to contain anything else except traces of hydrochloric acid.   It is then to the formation of lactate of iron in the stomach that the efficacy of the ferruginous preparations are due.

MM. Gelis and Conté cite, in support of this assertion, the results of several experiments, which they have made for the purpose of testing the action of the lactic acid upon some of the ferruginous preparations most employed.   They perceive, that among these preparations, those which dissolve most readily in this acid are precisely the most active.   They hence regard it as probable that the iron taken into the stomach is changed into lactate of iron, and only acts after being combined with lactic acid.   This theory gives rise to the idea of administering the lactate of iron ready formed.   With this new remedy, the action of the stomach is reduced to the simple process of absorption, and the effect of the remedy no longer depends upon the greater or less acidity of the gastric juice.

Nevertheless, however well founded these presumptions appear, they cannot be admitted with confidence until they have been verified by clinical practice.

MM. Fouquier, Bally, Bean, Rayer, Nonat, and Bouillaud have experimented with the lactate of protoxide of iron, and have collected a large number of observations on chlorosis treated with success by this new medicine.

MM. Gelis and Conté prepare the lactate of iron by treating pure iron filings with lactic acid diluted with water ; they then introduce it into lozenges in which the sugar prevents the super oxidation of the iron, and preserves the medicine at the same time that it gives a facility of administration.   Each lozenge contains seven or eight centigrammes of lactate of iron ; four, six, or even ten may be given during the twenty-four

hours to each patient, who should continue their use for eight or fifteen days.

Each chlorotic patient treated by M. Bouillaud had used for the re-establishment of health, as an average, about six to eight grammes of lactate of iron. All had perfectly borne its use. A remarkable augmentation of the appetite was one of the first effects perceived.

M. Bouillaud, depending on the results of the trials of his colleagues and his own observation, terminates his report by concluding that clinical research permits us, for the present, to rank the lactate of iron as among the most useful of the ferruginous preparations.   F. B.

Jour. de Phar.

ART. XX.—PROCESS FOR THE PREPARATION OF THE LACTATE OF PROTOXIDE OF IRON.   By M. Louradour, Pharmacien.

M. Louradour extracts the lactic acid from the whey which he collects from the dairies in the neighborhood of Paris, where much cheese is made. This whey, exposed a long time to fermentation under the influence of an elevated temperature, becomes charged with a large quantity of lactic acid. It is evaporated to one-third or one-fourth of its volume, decanted and filtered ; and is then saturated with milk of lime, which produces an abundant deposit chiefly of phosphate of lime. The filtered solution is precipitated by oxalic acid, and again filtered, and then concentrated to a syrupy consistence. It is now diluted with alcohol, which precipitates the lactine and the salts. The solution on being filtered and the alcohol distilled off, yields pure lactic acid. The lactate of the protoxide of iron is prepared by digesting on a sand bath, at a low temperature, this acid diluted with water upon iron filings. At

the end of six or seven hours of the reaction, the liquid is boiled, filtered and concentrated, when, on cooling it deposits crystals. These crystals drained in a funnel and washed with alcohol, by displacement, should be rapidly dried and enclosed from any contact with the air.

This salt, such as M. Louradour has shown us, and such as we have ourselves obtained by following his process, which is economical and easy of execution, presents itself under the form of crystalline plates, very white, and but slightly alterable. It is but sparely soluble in water, reddens litmus paper, and possesses the ferruginous taste in a tolerable degree ; when dissolved in water it attracts oxygen and quickly becomes yellow.

The sparing solubility of lactate of iron has allowed M. Louradour to simplify even more his process, by suppressing the purification of the lactic acid by alcohol, and treating it immediately by the iron filings ; the liquor suitably evaporated, affords crystals of the lactate ; the foreign salts and the lactine remain in the mother waters, which are rejected.　　F. B.

Journ. de Pharm.

ART. XXI.—OBSERVATIONS ON THE SUPPOSED FORMATION
OF INORGANIC ELEMENTS DURING FERMENTATION. By
J. DENHAM SMITH.

IN the October number of the last year's Philosophical Ma-
gazine, (vol. xv. p. 329,) there appeared an abstract of various
papers read at the meetings of the Royal Society, one of
which, entitled " Additional Experiments on the Formation
of Alkaline and Earthy Bodies by Chemical Action when Car-
bonic acid is present, by Robert Rigg, Esq. F. R. S.," at-
tracted my notice, from the novel and most extraordinary na-
ture of the results announced in it.

Although the Royal Society has always carefully disclaim-
ed any participation in, or support of, the theories and obser-
vations brought before the public or published by it, yet the
circumstance of a paper being read to the first learned society
of these kingdoms, and the author of the paper a fellow of the
society, gives weight and sanction to the observations adduced.
This circumstance was one of the chief reasons which led me
to make the following experiments on the subject of this novel
formation of inorganic elements by catalytic action.

I much regret that in the abstract of the paper which ap-
peared in this Magazine, no details of any of the experiments
were given ; the substances used, the apparatus and the results
obtained, only being mentioned. It appears that "the author
gives a detailed account of several experiments in which su-
gar, water, and yeast only were employed, and from which he
deduces the conclusion that alkaline and earthy matters are
formed by chemical action. In one set of experiments, some
of which were made in silver, others in china, and others in
glass apparatus, after the vinous fermentation had gone on dur-
ing five days, the quantity of ashes obtained was, in the silver
apparatus, eighteen, in the china nineteen, and in the glass fif-
teen times greater than the previous quantity. A further ex-
amination of these ashes showed that they consisted of po-

tash, soda, lime, and a residue not acted upon by muriatic acid."

Thus having no data of the respective quantities of sugar, water, and yeast, Mr. Rigg used, I may not have employed these substances in the proportions with which he experimented ; if this should be the case, I presume, however, that this circumstance will not in any way tend to vitiate the results I have obtained, the question being whether inorganic matter is produced during vinous fermentation.

To satisfy myself respecting the correctness of Mr. Rigg's statement that the quantity of inorganic matter in a liquid is increased from fifteen to nineteen times when carbonic acid is present, I dissolved 1500 grains of the best refined sugar in one and a half pints of distilled water, and added 200 grains of risen beer yeast, then thoroughly mixed them by agitation. This solution was passed through fine cambric to separate any insoluble impurities which the solution contained, and divided into three exactly equal portions.   Of these, two portions were respectively placed in German glass jars, and immediately covered with unglazed paper covers ; the paper was of a close texture and carefully gummed down round the exterior of the jars, to prevent any inorganic matter, as dust, &c., from getting into the solutions.   These jars were placed in a warm situation in the laboratory, the temperature varying from 60° to 70° F., and the fermentation allowed to proceed. The third portion was then put into a flask and boiled, occasionally adding pure nitric acid ; this acid left no stain when a portion was evaporated to dryness in a porcelain capsule ; the flask was kept in an oblique position, to prevent any of the liquid being ejected by the action of the nitric acid.   During the ebullition of the liquid, nitrous acid fumes were slowly formed, and the liquid assumed a primrose yellow color ; numerous spherules of liquid were formed, and coursed hither and thither with great velocity, the larger spherules seemingly attracting the smaller ; and when by this union the globule had attained about the size of a coriander seed, it disappeared, being again united to the bulk of the boiling solution.   I imagine that this

singular and interesting phenomena is owing to small portions of the liquid being ejected from its bulk by the rapid action of the nitric acid on the organic matter in the liquid; and that these particles on again approaching the surface of the fluid, there meet with a stratum of nitrous oxide gas, or of this gas mixed with steam, which prevents their contact with the subjacent liquid, and upon which stratum they float, until by the increase of size, and consequently of weight, the buoyant power of this stratum of gas or vapor is insufficient to prevent their coming in contact with the mass of the liquid, and that they then reunite with it, disappearing instantaneously.

Oxalic acid was formed and then decomposed by the continued action of the nitric acid ; and the residue of the liquid after evaporating to dryness in a platinum crucible weighing 630.4 grains, was ignited to redness in a gas furnace, with the occasional addition of a few drops of nitric acid ; an ash of a light buff color remained, weighing, with the crucible, 631.97 grains,—630.4=1.57 grains of inorganic matter contained in 500 grains of sugar and 66.6 grains of yeast before fermentation.   On examination, this ash was found to consist of an alkaline carbonate, traces of a chloride and a sulphate, phosphates of lime and magnesia in large proportions, and minute traces of silica and oxide of iron.

At the expiration of six days, one of the portions which had undergone vinous fermentation, and which presented the agreeable odor accompanying this stage of fermentation, was evaporated in a mode and with precautions exactly similar to the above, and the same phenomena were observed during the operation.   The residual liquid evaporated to dryness in the platinum crucible weighing 630.38 grains, and ignited over a gas lamp to full redness, as in the first experiment, afforded an ash similar in appearance to the former, which, with the crucible, weighed 631.97 grains,—630.38=1.59 grains of inorganic matter, yielded by 500 grains of sugar and 66.6 grains of yeast, after undergoing the vinous fermentation.   This ash was similarly constituted with that obtained in the first instance.

From these experiments we find that whilst 500 grains of sugar, and 66.6 grains of yeast, afford, previous to fermentation, 1.57 grains of inorganic matter ; when fermented they give 1.59 grains, an increase of one-fiftieth of a grain, or about one and a quarter per cent., an increase so trifling that I do not hesitate to refer it to an error of experiment, and not to the formation of inorganic elements during vinous fermentation, which Mr. Rigg asserts is the case. I therefore conclude, contrary to the views entertained by Mr. Rigg on this subject, that there is no formation of inorganic matter during the progress of vinous fermentation.

I am at a loss to offer any feasible explanation of the enormous increase of inorganic matter observed by Mr. Rigg, the only mode by which this could have taken place, which at present occurs to me, and that an unlikely one, is that sufficient precautions were not taken to prevent the introduction of foreign matters by securely covering the solutions of sugar and yeast while fermenting ; and that a quantity of dust, the constant plague of a laboratory, became mixed with his solutions, and thus led Mr. Rigg to suppose that the alkalies and earths were really formed during fermentation. I may remark that the paper covers with which my fermenting solutions were protected from dust, were so thickly covered with it, that, had the precaution of covering the solutions not been taken, I must have obtained a very considerable increase in the weight of the ash after fermentation, although I do not imagine that it would have been to the extent of fifteen or nineteen times the weight of the ash previous to it.

Lond. and Edin. Phil. Mag.

ART. XXII.—MEMOIR UPON THE ORIGIN AND DISTINCTIVE
CHARACTERS OF THE TURPENTINES. By M. Guibourt,
Professor in the School of Pharmacy.

(CONCLUDED.)

*Of the Turpentine of the Fir, called Venice Turpentine,
Alsace Turpentine, Citron Turpentine, and formerly
Bigeon.* *

I think that it would be a useless undertaking to present a
continuous historic account of the long confusion which has ex-
isted between the fir or *abies* of the Latins, and that species of
fir called *picea*.   Jean Bauhin is the first who gave an exact and
particular description of each of them, and who complete-
ly distinguished between them.   After him, Linnæus ran
the risk of again confounding them, by giving to the first
the name of *Pinus picea*, and, to the last, that of *Pinus
abies*.   At present these two trees belong to the genus Abies,
and are named, the first, *Abies taxifolia* ; the second, *Abies
excelsa*.

The fir or *avet* (a name derived from the Italian *abeto*, it-
self coming from *abies*,) grows in a pyramidal form 100 to 130
feet in height ; its branches are arranged in regular whorls, and
extend horizontally.   Its leaves are sparse upon the young
branches, but compressed and directed in two opposite rows,
which gives to them the appearance of the foliage of the yew,
or the teeth of a comb : hence, the names of *Abies taxifolia*,
Desf., or *pectinata*, D. C.   These leaves are linear, flat, coria-
cious, obtuse, or emarginate.   They are shining, of a deep
green above, whitish beneath, (with the exception of the green
median line,) which has given a resemblance to the tree known
by the name of *silver fir*.   The male flowers form isolated cat-
kins in the axils of the leaves, and are disposed in great num-
ber near the extremity of the branches.   The female flowers

* Bigeon is the French abreviation for *abiegna* or *abietina*.

form catkins almost cylindrical, disposed to the number of two or three, not at the extremity of the branches, but generally at their last division. These catkins are directed upwards, and preserve this position in becoming elongated ovoid cones, formed of flat scales, which are rounded, serrated, and imbricate. Each scale is provided upon its back with a bract, terminating in an acute point, which appears on the outside of the cone. The seeds are pretty large, and surrounded with a membranous wing.

The fir grows upon all the high mountains of Europe, and principally upon the Alps of Tyrol, of Valais, of Dauphiny ; in the Cevennes, the Vosges, Jura, the Black Forest ; in Sweden and Russia.

The *epicia* (*Abies excelsa*) attains nearly one hundred and fifty feet in height ; it is the most elevated of the trees in Europe ; its branches are arranged in whorls less regular than those of the preceding ; its leaves are linear, *quadrangular, pointed*, inserted all round the branches. The female flowers form small *solitary* catkins *at the extremity of the branches*, and the cones, when grown, depress, by their weight, the extremity of the branches, and hang downwards. These cones are four or six inches long, cylindrical, formed of flat scales, sulcated at the summit, and destitute of bracts.

This tree, unlike the first, can lose its terminal summit, without interfering with its increase of height. When in Savoy last autumn, I observed, with respect to this, a singular fact. There exists upon the side of Montmelian, on the other side of the Iser, at a place called Blondet, a wood of the epicia, which presented to me, at first close upon the road, an elevated tree, having two straight stems running almost perpendicularly side by side, for separated as they were at the origin of the branches, there was not between them an angle of three or four degrees. This fact surpised me more when, looking into the forest, I saw a considerable number of trees, apparently of the same age, and provided with two similar trunks. At last I found the explanation in a young fir, the trunk of which was broken at the height of six or seven feet. Of seven branches

which composed the highest whorl, two which were little developed had preserved their horizontal position ; two others had extended themselves at an angle of about ten degrees ; a fifth, at twenty degrees ; finally, the two last, the most vigorous, had straightened themselves, so as to approach the perpendicular. Between them could be perceived the broken trunk ; but it was evident that as the new stems increased in diameter, marks of the broken trunk became obliterated, and it then appeared as if the stem below bifurcated naturally.*

These species differ as much from the nature and position of the resinous juices as from their botanical characters. The first, as has been seen, furnishes a clear transparent liquid resin, which is formed in little bladders formed upon the bark of the young branches ; and, if incisions are made in the bark, so little turpentine flows out, according to Duhamel, as to merit no attention.† The second, on the contrary, presents very few vesicles upon the bark, but if notches are made into it, there will flow, between the wood and the bark, an abundance of opaque thick juice, which soon solidifies by contact with the air, and never runs to the ground. This resin, when detached from the trunk with a scraper, melted with water in a boiler and strained, constitutes the true *yellow pitch*, or *Burgundy pitch*.

All these facts are known, in the books at least, and I have already avowed that I have no pretension to novelties ; but since many persons still attribute the turpentine of the fir to

---

* I presume that it was in 1813, at the time of the defence of the fort of Montmelian, attacked by the Austrians encamped at Bondet, that the fracture of so many trees occurred.

† I have supposed, erroneously, (in the *Historie des Drogues*, tom. ii, p. 577,) that the fir produces two species of turpentine, one a clear transparent liquid, having a citron odor, obtained in the Vosges by puncturing the vesicles of the bark; the other thicker, more colored, of an oppressive odor, very acrid and bitter, collected in great quantity in Germany and other countries, by making incisions into the trunk. I have been led into error by the name of Strasburg Turpentine, which this last turpentine generally bears. As I have said before, it comes principally from Sweden, and is derived from the larch.

the larch and reciprocally,—and since the greatest number, I believe, at least, are not acquainted with the *Burgundy pitch*, which is a production of our own country, it was necessary to procure specimens from the trees themselves. What I did with respect to the resin of the larch, I also was desirous of accomplishing with respect to the firs ; and having found in the Commercial Calendar that the commune of Gerardmer, in the department of Vosges, produced a good deal of white pitch, I wrote to M. Choulette, a pharmacien, without personal knowledge of him, but persuaded that I should not appeal in vain to the spirit of fraternity and the love of science which animates French pharmaciens. M. Choulette, a well informed botanist besides, had left Gerardmer for Strasbourg, but having kept up his relations in the country, immediately complied with my desire, and on the 6th of September, 1838, sent me specimens of the resinous products of the Vosges,—consisting of the turpententine of the A. *taxifolia*, the rough and the purified pitch of the A. *excelsa*, and the black pitch of the wild pine, accompanied with branches and fruit of the trees from which these products had been obtained, and the information which follows :—

"The forests of Vosges," says M. Choulette, "are filled with the *Abies taxifolia* ; this species is the most numerous. The A. *excelsa* is also frequently met with. The first, in patois, is called *sep*, the second *fie*. There also exist different species of pines, but arising from artificial dissemination. The propagation of the first is accomplished sometimes artificially, but it is infinitely better when it is accomplished naturally. A north exposure appears to be the most favorable.

" The turpentine is collected upon the common fir. The larch, which is also met with frequently in the Vosges, equally furnishes it. But the administration does not permit its collection either upon one or the other, at least by means of gashes made in the trunk, because this operation is injurious to the subject of it, and may cause it to perish. In fact, the turpentine may be extracted from the fir by merely rupturing the vesicles of the bark ; but this is so little practised in

the Vosges, that during my residence in the country, I obtained from a distance nearly all that I employed. In return, however, the little that I could procure upon these localities, rivalled the handsomest afforded by commerce. The trade in white pitch, in spite of the restrictions placed upon it by the administration, is more general. It is derived from the A. *excelsa* by the method which you have indicated. It is enclosed in fir boxes, made in the country, and exported under the name of *pitch*, but the inhabitants are not aware that it is their own which is sold under the name of *Burgundy pitch*. It is principally in Loraine and Alsace that this exportation occurs.

" The black pitch which I send you has been made at Ronges Eaux, near Bruyères, by the following mode :   The wood of the trunk of the tree, *Pinus sylvestris,* is cut into billets four or five feet long, placed in heaps upon a stone foundation, burnt with a smothered fire, and collected in boxes of fir wood.   It is also obtained from the branches of the tree, but principally from the trunk."

The turpentine of the fir which was sent to me by M. Choulette, is almost as liquid as olive oil, which very well justifies the name of oil of fir, given to it in Italy.   It is opaque and whitish, although the resinous juice in the vesicles is perfectly transparent, but it can be readily understood that the moisture of the torn portions of the bark becomes mixed with the resin and produces this opacity.   When the resin is purified by filtering in the air and sun, or perhaps also by long standing, this moisture disappears, and the resin then forms a liquid a little more consistent, transparent, and hardly colored.   Its odor is sweet, similar to the citron ; its taste is moderately acrid and bitter, so that Mathiolas and others are wrong in attributing greater bitterness to the turpentine of the fir than to that of the larch ; it is certainly the contrary which holds.

The turpentine of the fir, when recent, is almost as turbid and liquid as that of the *Balm of Mecca*, but independently of the odor peculiar to each, which distinguishes them, they are not affected in the same manner by water.   When a drop

of the balsam of Mecca is allowed to fall upon a glass of water, the balsam extends itself instantaneously and completely over the whole surface of the liquid, in a thin and nebulous layer. By waiting a few moments to allow the volatile oil to evaporate, the resin becomes so solid that by touching it with a pin, it can be removed in a consistent mass. When a drop of the turpentine of the fir is allowed to fall upon a glass of water, it precipitates to the bottom at once, then returns to the surface, retaining the form of a well defined globule. Yet if the surface of the liquid be carefully examined, it will be found covered with a thin pellicle, presenting all the colors of the rainbow ; so that the contraction of the drop of resin appears to be owing to the layer of volatile oil which is produced immediately upon the surface of the water, but by little and little the drop spreads itself unequally, and pushes the irridescent layer to different points of the surface. Both parts are then equally resplendent by reflection. Lastly, inspected after a few minutes, the resin, as in the *Balsam of Mecca*, is sufficiently solid to be removed in an entire piece with a pin.

This mode of treatment indicates great volatility in the volatile oil of the turpentine of fir ; and, in fact, when kept in a vessel not hermetrically sealed, it is not long in forming a solid pellicle upon its surface, which is not the case with the turpentine of the larch ; and when exposed to the air, in a thin layer upon a leaf of paper, it drys completely in eight and forty hours. If at another period I have expressed a contrary opinion, it was because I then took for the turpentine of the fir, an article which was that of the larch. Finally, the larch turpentine is entirely soluble in alcohol, whilst that of the fir contains a resin entirely insoluble in that menstruum. Thus, take a nebulous turpentine of the larch, and it will form a transparent solution with alcohol, while, on the contrary, the most transparent turpentine of the fir will form a lactescent and turbid solution, and, in clarifying itself by time, will deposit upon the side of the vessel, a granulated insoluble resin. These characters are moreover entirely conformable to the analyses of the two turpentines made by Berzelius, as regards

the first, and M. Amédée Caillot, as regards the second. I have, moreover, noticed the close analogy there is between the turpentine of the fir and balsam of Canada, derived from the *Abies balsamea*. Both, in fact, are liquid, almost colorless, transparent in a state of purity, very drying, and acquiring, by time, a golden yellow color, of a sweet odor, (different, nevertheless, in each,) and imperfectly soluble in alcohol. This close resemblance, however, is not astonishing, as the trees are scarcely different, both having the distich leaves, silvery beneath, and the upright cones formed of rounded scales, accompanied with bracts. Both equally furnish a resin from the vesicles, which appear twice annually upon the surface of the bark. If, then, it be desirable to find a succedaneum for the balsam of Canada, it is evident that it is the turpentine of the fir, in the same way as in place of Chian turpentine we employ mastick. With respect to the turpentine of the larch, it differs from all others, so that it cannot be substituted by any one of them.

Yellow, or Burgundy Pitch.

Nothing more is left for me in this article, in consequence of the preceding details, but to set forth the characters of the true Burgundy Pitch, for which is substituted every where a factitious pitch, fabricated out of the rosin of the maritime pine, melted and admixed with a sufficiency of Bordeaux turpentine or its essence, to give it the consistence of the native pitch. This substitution may appear to many persons of little importance; yet if it be admitted that the odor, in short, the peculiar nature of medicines, have no influence upon their medical properties, perhaps the confusion will not be regarded as an indifferent fact, which has become established between two resinous substances.

The resin which flows from the A. *excelsa*, either naturally or artificially, is colorless, at first semifluid and nebulous, and its odor resembles that of the turpentine of the A. *taxifolia*; but by drying, when exposed to the air, a singular circum-

stance takes place ; some of the parts remain white, soft, and preserve their odor like citron, while others become red, and assume a peach-blossom color, or that of the lees of wine, like assafœtida. The latter portions at the same time contract a stronger odor, which, without being disagreeable, somewhat resembles that of castor. The whole, melted together in water, as is practised in countries where the resin is prepared, affords an opaque pitch of a deep fawn color.

The odor is entirely peculiar, pretty strong and balsamic ; its taste is sweet, perfumed, not bitter. Apart from the impurities which this resin may contain, it is not completely soluble in rectified alcohol, and although the quantity of insoluble resin is little considerable, it still serves to distinguish it from factitious pitch, which is completely soluble. The alcoholic solution of the native pitch has a pretty deep reddish color, and its taste is bitter, although the undissolved resin appears insipid.

The factitious pitch, or that of the maritime pine, is of a pale yellow and its color becomes paler as it is beaten with water ; it easily becomes dry and cracked upon its surface, is less adherent and tenacious than burgundy pitch, has a very marked bitter taste, and possesses the strong and disagreeable odor of Bordeaux turpentine, or its essence. It is entirely soluble in alcohol.

Resin of the Larch Pine.

Several years have elapsed since our associate, M. Beral, sent me a specimen of the resin of this pine, used in Russsia for the purpose of fumigating apartments. This resin was in irregular tears, fragile, reddish upon the surface, but opaque and whitish internally ; of a strong and balsamic odor, somewhat similar to castor ; of a very bitter taste ; it was contained in a box made of the bark of the fir. A Russian Princess, residing in Paris, had desired, unsuccessfully, to procure from us this resin, to the use of which she was accustomed ; and not being able to obtain it, was obliged to send to Russia for it.

This substance, however, had several times previously been

brought to France; once it had been given to me for *Tacca-maha*, and I described it under this name in the second edition of the *Historie*, &c. Afterwards, I met with it in the cabinet of the School of Pharmacy, contained in the bark mentioned, and still more recently, M. Ramon de la Sagra, brought from the island of Cuba, among a great number of other products, the same fragrant resin, produced by a pine of Cuba, of which he had not been able to determine the species. This resin was in pretty large spherical tears, of a dull reddish aspect externally, but whitish, opaque, and of a smooth fracture internally. Its powder has the color of brick-dust. Its solution in alcohol was complete, even to the whole almost of the impurities.

I speak of this substance in connection with the pitch of the *Abies excelsa*, because, according to Haller, cited by Murray, the resin which exudes spontaneously through the bark of this tree, concretes under the form of tears, which exhale an agreeable odor when burnt; from which arises the appellation of *incense*, (in Swedish, *gran kada*,) because this resin, by drying upon the tree, assumes in part, as we have seen, the red color, and peculiar odor of Russian incense; and finally, because this is contained in a red compact bark, which appears to me to be that of the A. *excelsa*; a fact which still further establishes the presumption that it is the product of this tree. Murray, however, adds that, according to other individuals, this incense is the product of the wild pine, and we have said that in Russia, as in Cuba, it is attributed to a pine; the two opinions are therefore equal as regards value.

I was endeavoring to enlighten myself upon this subject, when, upon examining in the Royal Garden, the trunks of some trees which had been felled, I found one of them covered with resinous excrescences resembling completely that forming the subject of this note. By singular chance, a gardener, when interrogated, replied at once it was a fir tree, which afforded weight to the opinion of Haller; but farther investigation, which was more precise, proved to me that it was the trunk of the *Pinus larix*, and I found another still standing

which presented a similar exudation. Thus, what is clear to me at present is, that the larch pine produces this reddish resin, with an odor similar to that of castor, which is used as incense in several countries of the north. We should not be embarrassed by the name of Corsica Pine, which this tree also bears, for M. Loiseleur Des Longchamps has recognised its existence in the United States and Canada, where Michaux has described it under the name of Red Pine. Hence it is not astonishing that it is found equally in Cuba and the north of Europe. But as is the case with a great number of resinous exudations, this does not occur but when the tree is attacked by disease. Thus, in the Royal Garden, the superb larch pine, which is in the middle of the botanic grounds, presented no trace of it, while that which was in a languishing state, in the midst of a grove of yews, against one of the new greenhouses, presented, for two years, an exudation, increasing in proportion as the tree approached its end.

Of the Galipot and Bordeaux Turpentine.

These two products of the maritime pine are so well known that I shall speak of them only to place their characters in opposition to the two preceding resins.

Bordeaux turpentine is generally thick, opaque, grumous, possessed of a strong and disagreeable odor, and having an acrid and bitter taste. That which is most liquid, when kept in a cylindrical vessel, separates into two parts, an upper, which is transparent, always consistent, and of a deep color; and a lower, which is opaque and grumous, forming about a fourth of the whole quantity. The common turpentine of commerce does not present the liquid supernatant portion; it is very thick and opaque, and appears entirely formed of a granulated resinous deposit. Both, if exposed in a thin layer to the atmosphere, become dry in twenty-four hours. Both, even the most liquid, solidify promptly by the addition of $\frac{1}{32}$ of calcined magnesia. This property is so marked, that it is sufficient to add a sixth of Bordeaux turpentine to copaiba, which is not solidifiable by magnesia, to give to it this proper-

ty, while the turpentine of the larch not only does not solidi-
fy by magnesia, but destroys this property in copaiba, which
possesses it.

The galipot, or *garipot*, is the resin of the maritime pine
hardened upon the trunk and collected in winter; it is in the
form of semi-opaque incrustations, solid, dry, fragile, like crys-
tals, yellowish, having a smell like that of turpentine, and a
bitter taste.   It is completely soluble in alcohol.

As the turpentine of the *Abies taxifolia* has its analogy in
America in the balsam of Canada, so Bordeaux turpentine is
represented by that of the *Pinus australis*, or three-leaved
pine, upon the banks of the Mississippi.   This, in commerce,
is called *Boston turpentine*, although it comes from the
southern portions of the Union.   It has a turbid, grumous as-
pect, the odor and taste of Bordeaux turpentine, and possesses
the same properties.

Thus, as I have stated at the commencement of this notice,
my principal object has been to describe the turpentines of
commerce.   I shall then pass over, in silence, the less impor-
tant resins of the cedar, of the mugho pine, the cultivated pine,
and others.   I am, moreover, destitute of specimens which
would enable me to speak with perfect assurance.   I shall con-
clude by recapitulating the principal characters of the tur-
pentines.

Chian Turpentine,—Nebulous and almost opaque, very
consistent and almost solid, of a gray green color, or greenish
yellow ; of a weak odor of fennel or resin of elemi ; of a fra-
grant taste, destitute of all bitterness and acridity.   Treated
with rectified alcohol, it leaves an insoluble residue, which is
resinous and glutiniform.

Turpentine of the Larch,—Of the consistence of honey,
viscid, and not running when the vessel containing it is tilted,
except in hot weather ; uniformly nebulous, or incompletely
transparent ; color little marked, greenish yellow ; odor te-
nacious, a little oppressive; taste very bitter, united to great
acridity in the throat; very little disposed to dry, and pre-
serving for a long time its consistence in the air ; not solidi-

fied by one-sixteenth of calcined magnesia ; entirely soluble in rectified alcohol.

Turpentine of the Fir,—Milky, but becoming completely transparent by repose and filtration ; entirely liquid or at least pretty fluid ; odor very sweet, similar to citron ; taste moderately acrid and bitter. Pretty rapidly dried by the air, and solidifiable upon the surface ; equally solidified by one-sixteenth of calcined magnesia. Not entirely soluble in alcohol. The solution, turbid and lactescent at first, deposits, upon clearing, a granulated insoluble resin.

Balsam of Canada—Turpentine of the Abies balsamea,—Liquid, of perfect transparency, or occasinally nebulous, but becoming completely transparent by rest ; almost colorless when recent, but taking by age a golden yellow color ; odor strong *sui generis,* very agreeable ; taste moderately acrid and bitter, very drying, and becoming dry and cracked upon its surface even in closed bottles, when they are partially empty. Very imperfectly soluble in alcohol.

Turpentine of the Epicia or Burgundy Pitch,—Solid, although running ; very tenacious, opaque, of a fawn color, a strong balsamic odor, sweet, aromatic, not bitter taste ; not completely soluble in alcohol.

Factitious Pitch of the Maritime Pine,—Almost white or pale yellow, solid, flowing, but becoming dry and cracked upon its surface. Marked bitter taste, odor strong of Bordeaux turpentine or its essence, entirely soluble in alcohol.

Bordeaux Turpentine,—Thick, grumous, and separating into two layers, one colored and transparent, the other granulated, consistent, and opaque, or rather entirely formed of a grumous deposit ; consistent and opaque, of a strong disagreeable odor ; of a very acrid and bitter taste ; very drying in the air ; readily solidified by magnesia, entirely soluble in alcohol.

Journ. de Pharm.

ART. XXIII,—ON INDIA OPIUM.

(Extracted from a Manual of Chemistry, by W. B. O'SHAUGNESSY. M. D.,
Professor of Chemistry and Medicine in Calcutta Medical College.)

" To this important subject I propose to devote more space
than it generally claims in elementary treatises on chemistry.
The place it holds as a source of enormous revenue, and an ar-
ticle of the highest commercial interest, induces me to treat
of it in this detail ; and I do so the more readily from the op-
portunities I have enjoyed of becoming practically familiar
with the subject, having held the appointment of assistant to
the Opium Agency of Behar for a considerable period. De-
tails relative to the cultivation and gathering of the drug do
not of course fall within the object of this manual ; moreover,
on this department of the subject, a paper published by Dr.
Butter in the Journal of the Asiatic Society provides the most
ample and interesting information. In this section, then, I
propose to give, first, a sketch of the composition of opium ;
secondly, of the manipulations to which it is subjected in the
Government Factory at Behar ; thirdly, of the mode of assay
by which its value is regulated ; fourthly, an account of the
exact analysis of the drug, and the composition of the varieties
supplied by the subordinate agencies of Behar ; and lastly, I
shall describe the adulterations to which the opium is so ex-
tensively subjected, and the methods by which these adulte-
rations may be recognised. The sketch thus given, will, I
trust, prove of utility in this great revenue department, and
contribute in some degree to the improvement of the drug as a
medicinal agent."

The following is the result of our author's examination of
opium at the Behar factory.

" The reception of opium at the Government factories com-
mences with the hot season, and terminates late in the rains.
The drug generally arrives in batches or *cheláns* of several
jars, the joint production of one *zillah,* or its subordinate *kotés*

or districts. The jars contain from twenty seers to one maund and it is no uncommon event to have five hundred of these paraded in the morning for the inspection of the Opium Agent and his assistants. The first examination and the resulting classification is extremely simple. The examiners thrust a slit bambu into the contents of the jar, and judge from experience of the state of consistence, flavor, and color of the specimen. Marks are chalked on the jar according to the degree of each of these qualities from 1.1.1. to 4.4.4. inclusive.

Opium of the first class is of a fine chestnut color, aromatic smell, and dense consistence. It is moderately ductile, and, when the mass is torn, breaks with deeply notched fracture, with sharp needle-like fibres, translucent and ruby-red at the edges. It is readily broken down under distilled water, and the solution at first filters of a fine sherry color, which, however, rapidly darkens. 100 grains of this opium will yield to cold distilled water an extract of from 35 to 45. The extract is a deep brown color, and very rapidly attracts moisture from the air. If 100 grains of this opium be evaporated at 212°, it loses from 20 to 28 per cent. of water, giving a consistence of from 80 to 72, the standard of the factory.

The second class of opium is of darker color, less agreeable, small; softer texture, and often shows black specks and globules of *pasewá* on its surface and on its texture. It draws out to greater length, but breaks with a more even fracture.

Its consistence ranges from 65 to 70° and it yields an extract averaging from 27 to 35 per cent.

The third class is black, pasty, of very heavy smell, drops from the examining rod, gives off from 40 to 50 per cent. of moisture on evaporation, but, owing to the great quantity of *pasewá* it contains, often gives a far greater per centage of extract than either of the two preceding classes. The extract is very dark, and deliquesces rapidly.

The last class comprises all that is too bad to be used in the manufacture of the balls. It is of all colors, from deep black to bright brown, and of all degrees of consistence, from fluidity to a solid texture.

After the cursory examination thus described, a portion of opium is taken from each jar of each *chelán* and mixed together, and from this mass three specimens of 100 grains each are accurately weighed and evaporated to dryness on metallic tables heated by steam to 200°. When dry, the residue is weighed in presence of the native agents or gomashtas by the first assistant : the weight indicates the consistence. All specimens above 70 receive a corresponding premium in the price paid : all below that number lose in proportion. The amount of extract is taken at the same time. On these data the officers of the factory proceed in sorting the jars for mixture in great tanks, into which they are all emptied. The jars are then washed and the washing with the opium of the fourth class is used for *lewa* or paste to agglutinate the covering of petals used in making up the balls.

As the receiving season draws to a close, the opium is gradually removed from the tanks and cisterns, and exposed to the air in shallow wooden frames, until by spontaneous evaporation it becomes of the required consistence, from 69 to 70. In this state it is delivered to the cake-makers. Each cake must be of a certain weight,—the envelope of petals and *lewa* included, and it is surprising to see the dexterity and precision with which the workmen *snatch* the exact quantity required from the large dishes at their side, seldom erring more than a drachm weight in a ball of four pounds. The balls of each day's manufacture are carefully inspected the following morning, and re-opened and adjusted if required. Finally, they are stored in a large airy turret to undergo thorough ventilation and drying of the envelope.

A certain quantity of opium of the first class is annually prepared with more care for the use of the medical service, for presents to some native potentates, and to the priests of a few favored temples. An inferior kind is issued on the requisition of the *zillah* authorities, under the name of *ábkári* opium, to the licensed drug retailers of the bazárs.

The annual official reports being simply required to state the amount of morphia and extract, and to give a general ac-

count of the physical qualities of the article, comparatively little attention is usually given to its exact chemical analysis. In proof of this, I may refer to the papers on Bombay opium published in the Transactions of the Medical and Physical Society, in which even the principle *narcotine* is not at all mentioned, and to the records of the Behar Opium Agency, in none of which is any *exact* analysis recorded. Of a multitude of specimens marked *morphia*, which I received on assuming charge of the factory, few contained less than 30, many 50 per cent. of *narcotine* and other substances. These inexact returns were perhaps unvoidable under the defective state of the laboratory, and the want of a sufficient number of practical assistants competent to manipulate analyses under the superintendence of the first assistant. But as practical native chemists can now be obtained at very moderate salaries, these defects, if they still exist, will doubtless meet an early remedy.

During my employment in this department I made a very extensive series of analyses of the opium furnished by each of the zillahs composing the Behar division. In the hope that they may prove of some utility, I append the processes employed, and a tabular view of the results obtained.

In the subjoined analysis either of the following modes of examination was adopted. The first is the quickest in its manipulation. The second has the advantage of supplying directly a fine muriate of morphia for medical use.

1st Process.—A quantity of opium (I usually operated on a seer) is accurately weighed and well rubbed with the hands under distilled water, until it is thoroughly broken down into a thin fluid. It is then filtered through *Naipal paper*, a texture of the greatest value in vegetable analysis, as it permits very rapid filtration, and is so strong that it may be twisted while wet like linen or calico. The washing is continued until the filtered liquor gives no precipitate with ammonia, and the watery solution is then evaporated to dryness on a water bath, and marked A. 1. The solid exhausted mark remaining on the filter is marked A. 2.

By this step a volatile acid with which the narcotine form-
ed a soluble compound is expelled ; so on redissolving the wa-
tery extract in distilled water, a black gritty crystalline pow-
der remains.   This is collected on a muslin filter, and boiled
in water and filtered, and the solution which contains *meconin*
evaporated to dryness.   As the evaporation proceeds, globules
of oily appearance collect at the bottom of the capsule, and, on
cooling, crystals of *meconin* of a rosy tint are obtained.

The residue of the black powder is then boiled with strong
alcohol and filtered.   On cooling, an abundance of snow-white
crystals of *narcotine* is deposited.

To the solution of the watery extract (A. 1) liquid ammo-
nia is gradually added.   The first portions separate a great
quantity of the *black resin*, which rises to the surface, or con-
cretes on the bottom and sides of the vessels, and should be
removed with a spoon and by decanting the fluid.   This resin,
though at first soft, rapidly hardens, and becomes a pitch-black
color and consistence.   When this has ceased to separate, am-
monia is added more freely, and *the solution heated to near-
ly* 200°.   This precipitates all the *morphia* in a crystalline
powder, varying in color from light fawn to that of dark clay,
according to the quality of the opium under examination, and
the care bestowed in the removal of the black resin in the pre-
vious step.   The morphia is purified by washing it first with
a little weak alcohol, and then dissolving in boiling alcohol as
much as it will take up.   The solution is filtered and set aside
in a tranquil place, and in twenty-four hours a large crop of
very fine white crystals is procured.   The solution evaporated
still further, yields additional crystals of an inferior color.

The watery solution of the extract A. 1, thus freed of mor-
phia, still contains meconic acid and ammonia, codeia, narceia,
gum, and coloring matter.   To separate the meconic acid, add a
solution of muriate of lime ; a precipitate of meconate of lime
is procured, which, when treated with muriatic acid, in the
mode described under the head of meconic acid, yields very
large crystals of bimeconate of lime.   From this the pure acid
is prepared according to the directions already given.

It is almost useless to look for *codeia* or *narceia,* owing to their minute proportion, in the fluid, by this process. The *gum* may be precipitated by strong alcohol, but it is seldom desirable to take the trouble of this step.

The solid mass A. 2 consists chiefly of oil, narcotine, caoutchouc, resin, and woody fibre. It should be first boiled in water acidulated with muriatic acid. Muriate of narcotine is dissolved out, and the narcotine may be separated from this by ammonia. The muriatic acid solution is generally of a pretty rose color, owing to the presence of traces of *narceia,* which have the property of communicating this tint to their dilute solutions.

The remaining solid mass is to be divided into very small portions, and allowed to rest in contact with a pretty strong solution of ammonia for twenty-four hours. This dissolves the oil and resin. The solution is decanted, and the solid mass marked A. 3. By cautiously adding an acid much diluted to this solution, the oil separates in globules which rise to the surface of the fluid, and the resin collects in dense clotted flakes, readily separated from the oil.

The mass A. 3 contains little but caoutchouc and woody fibre. The former may be removed by digestion with naphtha or sulphuric ether, and is obtained as the ductile mass on evaporating to dryness. The woody fibre or *lignin* now remains, and is characterized by its insolubility in alcohol, water, ether, or naphtha, and its fibrous thready texture.

In the preceding analysis I have taken no notice of the ulmine, which is so intimitely associated with the coloring matter that they may be classed under one head, as the general residue of the evaporation of the solution of A. 1, after the removal of its morphia and meconic acid, deducting, of course, saline or earthy matter which the incineration of a portion of the mass may show to be present.

Lastly, 100 grains of the opium examined, are incinerated in a plantinum crucible ; the residue, when heated until its black color disappears, gives the amount of saline and earthy matter which the opium con tains.

2d. Process.—This is directed chiefly to the procural of the muriate of morphia. The first steps of washing and separation of the meconin and narcotine are the same in both. The solution of the watery extract A. 1, is precipitated by muriate of lime, and the precipitate removed by filtration. The filtered liquid is next rendered neutral by adding some powdered chalk, then evaporated to the consistence of a syrup and set aside. In twenty-four hours it becomes a crystalline mass, which must be compressed between numerous folds of Naipal paper and coarse cloth. The crystals of muriate of morphia are purified by digestion with animal charcoal and water, and by three or four successive solutions in, and crystallizations from, hot water. The salt is then dried at 150°. It still contains codeia ; and is, indeed, the preparations from which this substance is obtained.

By adding ammonia to the muriate, all the morphia is precipitated, and the muriate and *codeia* remains dissolved. On evaporating this nearly to dryness and adding a solution of pure potash, the codeia is precipitated in flakes which crystallize from a hot alcoholic solution.

The remaining steps accord with those described in the first process. The alkali *narceia* can only be separated by operating on a much larger quantity of opium than can be properly sacrificed in a public establishment.

Many other processes have been recommended from time to time for the examination of opium. Boiling the solution of crude opium with magnesia, was the method usually adopted in the Behar factory. A solid precipitate was formed, containing meconate of magnesia, narcotine and morphia, and this, when boiled in spirit, gave crystals termed *morphia* in the official reports, but which, of course, were a mixture of morphia and narcotine. By using the solution of the watery extract A. 1, in the first process I recommend, the narcotine is, however, separated, and magnesia, instead of ammonia, may then be used to separate the morphia. The method is, however, practically inconvenient, and the long boiling it requires highly objectionable, because this tends to decompose

the alkaline bases of the drug, and diminish the quantity of morphia which should be obtained.

Analysis of 14 cases of Garden Opium of 5000 grains each.

Denomination.	Consistence.	Extract.	Color of extract.	Residuum of filtered extract, A. 1.	Precipitated from extract by ammonia.	Pure morphia per cent.	Narcotine per cent.	Codeia in 5000 grs.	Meconic acid.	Meconine in 5000 grs.	Lignine per cent.	Oil per cent.	Resin per cent.	Caoutchouc.	Earthy and saline matters.
Average of manufacture 1834, 1835, Behar Division, do.	71	44	Earthy red,	49 gs.	212	2¼	13	25 gs.		8	13				3¼
Sarun do.	7	42	Fawn,	5.25	217	3	12	20 gs.		9	12				3¼
Shahabad ditto	76	40	Earthy red,	9	198	2¼	14	5		10	14				3½
Tirhut ditto	77	39	Lighter than Behar,	106	286	2¼	16	...		a trace	16				3½
Patna ditto	76	40	Dark earthy red,	84	46	2¼	11	...		5gs.	11				3½
Bhagulpur ditto	79	30	Ditto ditto,	46	326	2¼	13	...		13	13				3½
Patna ditto	76	31	Dark clay,	53	337	1	12	...		10	12				3½
Purneah ditto	75	46	Earthy red,	45	375	2¼	2¼	11		10	9				3½
Hazaribagh ditto,	77	40	Light brown,	115	232	3¼	2¼	...		11	11				3½
Malwah of 1829,	77	47	Light fawn,	54	330	3	4	21		9	8				3¼
Patna Garden Opium, 1833,	89	57	Ditto ditto,	28.28	340	4¼	5¼	25		7	7				3
Dinajpur ditto,	87	50	Light brown,	49	656	10¼	6	20		14	8				3¼
Banaras, 1835,	79	45	Earthy red,	66	370	1¼	1	...		...	14				4
Pasewa from Sarun Opium,	71	41	Light brown,	47	230	3½	2	11		7	12				3¼
	61	50	Deep black,	150	354	1¼	2	...	2pc.	...	2				3

Meconic acid — *Averaged from 5 to 7 per cent.*
Oil per cent. — *Averaged from 2 to 4 per cent.*
Resin per cent. — *Averaged from 11 to 26 per cent.*
Caoutchouc. — *From 6 to 10 per cent.*

The analysis of the Garden opium is very remarkable.

From 40 lbs. of Smyrna opium of the finest quality, M. Couerbe obtained 1 oz. of meconine, 1½ of codeine, 1 oz. of narceine, and of morphine 50 ozs., or rather more than 10 per cent. In several experiments recently described by Professor Christison in his letter to M. Guibourt, (*Journal de Pharmacie, Octobre*, 1835,) the Malwa opium gave 9½ per cent. of muriate of morphine, while, in the hands of Mr. Duncan, Turkey opium afforded 10 per cent. of that salt. The best opium grown in Egypt yields 10 and a fraction per cent. From one very fine and dry specimen of the Smyrna drug, Dr. Christison obtained 14 per cent. of muriate of morphia. In all these cases the salt was rendered snow-white, and, dried at 140° before weighing, 10 parts of muriate of morphia correspond to 9½ of crystallized morphia.

The specimen of garden opium I examined was, perhaps, the finest which ever came under chemical analysis. It was grown on an alluvial soil over the rubbish of the ancient glacis of the citadel of Patna. The poppies were irrigated three times during the season, and no manure employed. The results deserve much attention. As we can grow in Bengal, at an insignificant expense, such opium as that I have described, it would be worthy of a great government to devote a few acres of ground in the vicinity of one of the factories to the cultivation of opium for the supply of the Medical Store Department. The opium now furnished is unquestionably good, (see its analysis under the head of division Hazáribágh,) but its quality may be rendered doubly fine, indeed superior to any opium in commerce, by the measure I venture to recommend.

It is not, however, for the morphia or its compounds, that the Chinese value the drug. The narcotine, codeine, and resin are more probably the stimulating agents which they prize, and which are sufficiently abundant in the average of the manufacture."

India Journal of Medical and Physical Science.

ART. XXIV.—NOTE UPON THE BARK OF PEREIRA.
By J. Pelletier.

SOME time back, during a visit to Bordeaux, a specimen was presented me of a bark which came from Brazil. My colleague, M. Guibourt, to whom I showed it, recognised it as that of Pereira, of which he had given a description in the 25th volume of the *Journal de Pharmacie*, page 706. More curious to know its nature than desirious of preserving it, I attempted upon it a few chemical experiments, and I was led to the conclusion that it contained an organic alkali, little soluble, and characterized by the beautiful purple color which it assumed by contact with concentrated nitric acid.

I wrote to Bordeaux in order to procure a greater quantity of the bark of Pereira, and continued my researches ; but I had not received an answer when M. Peretti, Professor of Chemistry at Rome, sent me a printed memoir upon the analysis of Pereira. I there found the announcement of an organic alkali, also characterized by the purple color assumed by the action of nitric acid.

It is, therefore, to M. Peretti that pertains, by right of priority, the discovery of the peculiar organic base of the bark of Pereira, and my experiments have but the advantage of confirming those of M. Peretti. But there remains much to be done upon this substance. I would wish that those chemists who can procure larger quantities of the bark, to engage in a work of investigation which promises so much interest.

Jour. de Phar.

ART.—XXV. NOTE UPON THE WHITE AND OPAQUE VARIETY OF AMBER. By C. Recluz, Pharmacien at Vaugirard.

It has been eight years since I remarked that Amber of the white opaque variety, when chewed, had a marked acrid taste, much more so than the brown variety, when treated in the same way. I concluded, from this first experiment, that the first variety must contain more succinic acid than the second, but not having been able to procure enough of it to submit to distillation, I postponed, to another period, the project of verifying my conclusion.

In January of this year, I procured half a pound of white opaque amber, containing, however, portions of the brown variety, because it was impossible to separate it entirely from the colored portions.

These eight ounces, submitted to distillation, afforded me

	oz.	dr.
Impure succinic acid, such as is employed in medicine, ...	0	6
Spirit of Amber, ...	0	2
Unrectified oil of Amber, . . .	5	0
Total, ...	6	
Loss, ...	2	

The brown amber submitted to the same operation, in the same proportions, afforded me

	oz.	dr.
Impure succinic acid, . . .	0	3
Spirit of Amber, ...	0	2
Unrectified oil of Amber, . . .	5	0
Total, ...	5	5
Loss, ...	2	3

These operations, repeated comparatively twice, have al-

ways given me the same results, which has led me to con-
clude, that the white opaque amber should be preferred by
pharmaciens to every other variety of the same fossil resin, 1st,
because its powder is more acrid, and consequently more active
when employed in fumigations; 2d, that it is more soluble in
rectified alcohol, and the tincture obtained being more charg-
ed with matter, must equally have greater strength ; 3d, that
this variety ought also to be preferred to obtain succinic acid,
because it gives double the quantity of the ordinary kind ; 4,
lastly, that the white opaque kind ought to produce a larger
quantity of the acid, and to have an acid taste more marked
than all the other varieties of amber.

Journ. de Chimie Medicale.

ART. XXVI.—RESEARCHES ON THE LACTATES, AND ON THE STATE IN WHICH UREA EXISTS IN THE URINE OF MAN, AND SOME OTHER ANIMALS.   By MM. CAP AND HENRY.

I. HAVING, during the last year, been required to analyse
an anomalous, viscous urine, we remarked, among other
circumstances, a much smaller proportion of lactic acid and of
urea than is usual in ordinary urine.   The remarkable proper-
ties of urea, and more especially those of lactic acid, caused us to
imagine that, in this instance, the morbid state of the urine
and its organic secretory apparatus, might depend upon the ab-
sence of these two principles, and we presumed, by their arti-
ficial combination, a new therapeutic agent would be obtained,
which might be useful in analogous affections.   Such were the
motives and objects of the researches which form the subject
of this essay.

The existence of lactic acid, which was long considered
doubtful, has been positively established by the recent labors
of MM. Pelouze and Jules Gay Lussac.   The presence of this

acid has been recognised in most of the secretions and fluids
of animals. It exists in the blood, milk, bile, saliva, sweat,
synovia, and urine, when in a healthy state. We cannot,
therefore, mistake the importance of this acid in the animal
economy, especially when we remark that it disappears under
the influence of certain morbid causes, as soon as the secre-
tions alter, thicken, coagulate, and then calculi and divers con-
cretions appear, formed, for the most part, of earthy and alka-
line phosphates. But these phosphates are very soluble in
lactic acid, a marked circumstance which very naturally ex-
plains the formation of the phosphatic calculi, and exhibits the
necessity of the presence of lactic acid in the organic fluids.

Prepossessed with the idea of restoring to the urinary ap-
paratus the two principles of which they are deprived in cer-
tain affections, we endeavored to combine artificially the lac-
tic acid and the urea. We accomplished this in a complete
manner by double decomposition, and obtained, after nume-
rous trials, a *lactate of urea*, crystallized in fine prismatic nee-
dles of extreme purity, and great whiteness.

But has not this preparation its analogue in the animal eco-
nomy ? was now the question to be asked, and of which we
did not hesitate to attempt the solution.

When we desire to obtain the urea contained in urine, we
concentrate this liquid to seven-eighths. There is then depo-
sited a large quantity of salts formed principally of chlorides,
alkaline sulphates, calcareous and ammoniaco-magnesian phos-
phates. If we separate this mass by the filter, there is ob-
tained a very acid, brown liquor, in which alcohol of 40° causes
the formation of small crystalline, acid, hygrometric grains,
which, purified by carbon, become prismatic crystals, which
are deliquescent, of a sharp taste, and redden litmus. If these
crystals are treated with hydrate of zinc and alcohol of 36°,
there is obtained, on the one hand, a lactate of zinc, and on
the other, by evaporating the alcoholic solution, a very pure
urea, not hygrometric, and possessing all the properties which
characterize this body. It is then evident that the crystal-
line grains, obtained by the simple evaporation of urine pre-

viously freed from its first salts, are principally formed of *lactate of urea.*

If we evaporate urine, rendered perfectly neutral by baryta, we obtain, after filtration, a liquid which, treated with etherised alcohol and evaporated in the open air or in vacuo, deposits crystals of lactate of urea.   This salt is accompanied, in healthy urine, by free lactic and phosphoric acids, of which the presence may be readily recognised by the following process. Treat the brown product, resulting from the concentration of urine, with sulphuric ether ; there is thus separated a very acid liquid, which, evaporated and mixed with oxide of zinc and baryta, will give lactate of zinc and phosphate of baryta. The granular precipitate produced by ether is principally composed of *lactate of urea.*

Being convinced that urea does not exist in human urine in a free state, but combined solely with lactic acid, we endeavored to ascertain whether this principal was combined in the same manner in the urine of other animals.

A certain quantity of the urine of a cow was evaporated to five-sixths in an alembic.   The thick brown residue, shaken up with alcohol of $35°$, gave rise to an abundant deposit, of a grayish yellow color, containing hippuric acid and alkaline carbonates, which were separated by the filter.   The alcoholic liquor, evaporated slightly, furnished a brown product, which soon became a pulpy mass ; this was expressed, and after being purified by carbon and boiling alcohol, deposited small needle-shaped crystals, which were neutral to test paper, and of a sharp, somewhat bitter, and slightly musky taste.

This crystalline mass was treated

1. By nitric acid.   There was a slight effervescence, and there was obtained pearly, lamellar crystals of nitrate of urea, and long crystals of hippuric acid, (uro-benzoic acid of Berzelius.)

2. By hydrochloric acid and heat.   A musky odor was developed, a brownish red deposit of a resinous aspect was form-

ed, which, purified by boiling water, gave, on evaporation, handsome prismatic crystals of hippuric acid.

3. By a slight excess of baryta. Alcohol of 40° was then added, and the liquid, after filtration and evaporation, deposited yellow crystals, which nitric acid changed in the super-nitrate of urea. The deposit not taken up by the alcohol, treated with hydrochloric acid and boiling water, on being filtered and evaporated, yielded crystals of hippuric acid. The hippurate of urea, artificially prepared and submitted to similar operation, presented characters which were entirely identical.

Experiments of the same kind were made with the urine of the horse with like results, except only that the volatile principle of the products exhaled the odor peculiar to the horse, and not to the cow. This odor, which is foreign to the hippuric acid, appears to proceed from a volatile resinous principle.

We were desirous of extending these researches to the excretions of birds and serpents. One of us had in possession a certain quantity of the excrements of the boa. We triturated these with pure baryta and a little distilled water, and, after moderately drying the mass, treated it with alcohol of 40°. The liquid, filtered and evaporated, gave, as a residue, a matter which nitric acid converted into supernitrate of urea. This latter principle was separated by means of carbonate of potassa and absolute alcohol. Urea had not been before noticed as one of the constituents in the excretory matters of reptiles.

Finally, the dried dung of the pigeon and the canary bird was moderately heated with distilled water and hydrate of baryta ; there resulted a mass which was dried and subjected to alcohol of 40°. The alcoholic solution was deprived of any slight excess of baryta by means of carbonic acid, and then distilled. The residue, of a yellowish white color, treated with nitric acid, gave rise to supernitrate of urea. The baryta, separated by the filter, retained, as in the preceding case, much uric acid, which allowed of no doubt but that the urea existed in the state of urate ; retaining the name uric acid, but which M. Liebig now considers as a combination of urea with a peculiar acid or a *radical.*

The first deduction we would draw from all these facts is, that in general, urea does not exist in urine in a free state ; that in man, and, without doubt, in the carnivorous animals, it is principally combined with lactic acid ; in the ruminating animals with hippuric acid ; and in birds and reptiles with uric acid, or a peculiar acid of which, according to M. Liebig, it serves as a radical.

II. Convinced, by these observations, of the real importance of the lactate of urea, we return to the study of this product, and its direct or artificial preparation.

It may be obtained either by direct combination of urea with lactic acid, or by double decomposition ; by acting on lactate of lime with oxalate of urea, or better, on the sulphate of urea by lactate of baryta. In either case it is necessary, in the first place to procure the lactic acid, or the lactates, in a perfectly pure state. The following is the process which we have found to succeed best.

Lactic acid is constantly forming in liquors which undergo the viscous fermentation and become sour, as, for example, in the juice of the beet root, the sour waters of rice and starch, mucilaginous solutions and sour milk. We have preferred sour milk, since it may be obtained in large quantities, and at a low price, from farms at a distance from large cities. Cow's milk, which is scarcely acid when first drawn, soon sours in contact with the air ; the curd begins to separate ; the serum becomes cloudy ; and, if heated, the coagulation of the curd and albumen is completed. In this state it is passed through linen, clarified by white of egg, filtered, evaporated to a syrupy consistence, and set aside for some days, when a large quantity of sugar of milk is deposited. The liquid is again strained and evaporated, by which an additional quantity of sugar of milk is deposited, and may be separated by straining or filtering. The residual liquid is now very acid ; it is to be mixed with five times its bulk of alcohol of 33°, which produces a precipitate consisting chiefly of sugar of milk. The liquid is allowed to settle, is decanted and filtered,

and a slight excess of hydrate of zinc added. The materials being thoroughly mixed by agitation, are moderately heated, and left for several days. There will then be noticed in the mass an abundant precipitate, surmounted by a clear liquid, which must be decanted and reserved for future operations. The precipitate is *lactate of zinc,* with an excess of base. It is to be boiled with eight times its weight of distilled water, and some animal charcoal; filtered while hot, and evaporated to form crystalline pellicles, which, being collected and purified, are very pure and white lactate of zinc. This salt crystallizes in fine needles, has an acid, styptic taste, is more soluble in hot than cold water, scarcely soluble in alcohol, and precipitates in white flocculi with alkaline sulphurets. Treated with baryta or slacked lime, it is changed into hydrate of zinc, and lactate of baryta or of lime.

The *lactate of lime* may also be prepared directly from sour milk, or rather with the alcoholic liquor resulting from the final precipitation of the sugar of milk. This latter liquid is to be treated with slacked lime, or a slight excess of chalk, heated, filtered while boiling, and evaporated to dryness. The residue is a kind of syrupy paste which, when moistened, assumes a crystalline mamelated appearance ; these crystals are to be drained, expressed, and treated with water and charcoal. The liquid concentrated and left at rest, becomes filled with crystalline tufts, which, dried by bibulous paper, present small crystals of a milky whiteness, crackling under the teeth, and of a somewhat bitter taste. When heated, it fuses and has a resinous appearance, but, on being moistened, does not fail to crystallize in the same manner. The lactate of lime is more soluble in hot than in cold water ; heated with sulphuric acid, a slight effervescence is produced, the mass blackens and gives off the odor of the rennette apples. We know that the acetates treated in the same manner give off acetic acid.

The lactate of baryta does not crystallize, as MM. Pelouse and J. Gay-Lussac have already announced ; it is procured under the form of a gummy matter, very soluble in water and in alcohol.

The *lactic acid* is prepared by means of these lactates of lime and baryta. The most simple process is that described by M. Pelouze, in the Annales de Chimie et de Physique. When in the state of liquid it is to be concentrated in vacuo. On the large scale, we may apply to this operation an apparatus proposed by one of us for the concentration of liquids free from atmospheric contact. This apparatus consists of a retort adapted to a refrigerant of large capacity ; this refrigerant is provided at its base with a stop-cock, and at its side with an exhausting pump, both exactly fitted. The lower stop-cock being closed, and the apparatus exhausted, the liquid is poured into the retort by means of a funnel with a stop-cock, and exposed on a salt water bath to the temperature of 50° c., or more, and thus distilled in vacuo, taking care to condense the volatile portions by means of a current of cold water. This apparatus, which is similar, in many respects to that of M. Roth, applied to the sugar refinery, offers the double advantage of distilling at a low temperature, and of avoiding the contact of air, always so prompt to alter organic compounds.

To the already known properties of lactic acid, we may add the following : when treated with peroxide of lead or deutoxide of barium, it is to a great extent changed into oxalic acid ; by the chlorites and the chlorous acid, the decomposition is rapid ; it forms, almost immediately, oxalates, of which the existence is very short, as is indicated by the effervescence and disengagement of carbonic acid, which almost instantaneously takes place.

Lactic acid, even dilute, promptly dissolves moist phosphate of lime ; it readily dissolves that which forms nearly the whole of certain animal concretions; such, for example, as the *tartar of the teeth*, which is nothing else than the phosphate of lime, mixed with a little organic matter. When placed in contact with even large fragments of this phosphate, they loosen and divide spontaneously, and soon totally disappear. Finally, the oxalate of lime is soluble, to a certain ex-

tent, in this acid.   Let us now return to the artificial preparation of *lactate of urea*.

To obtain this preparation in a direct manner, we begin by obtaining the lactic acid from lactate of lime. To this end, 100 parts of lactate of lime, pure and dried at 120°, is dissolved in 200 parts of hot water, holding in solution 41 parts of pure, dry crystals of oxalic acid.   This solution, when filtered, represents, in every 100 parts, 75 of pure lactic acid; 73 parts of pure dry urea is now to be added, the solution filtered and evaporated at a low heat, and crystallization effected in the usual modes.

It is, nevertheless, preferable to prepare lactate of urea by double decomposition, either by treating oxalate of urea by lactate of lime, or by acting on sulphate of urea with lactate of baryta. We should here make some observation on these two salts of urea, reserving, for the end of the essay, some general remarks upon the salts of this base, which our researches have afforded us an opportunity of studying.

The *oxalate of urea* has been described by Berzelius.   It is composed of urea 62.56, and of oxalic acid 37.44, in the 100 parts.   It is obtained by combining 10 parts of urea with 60 parts of oxalic acid, heated to 120°.   The mixture is dissolved in 6 or 800 parts of hot water, filtered and carefully evaporated to a pellicle, when the oxalate crystallizes in a mass formed of prismatic needles, interlaced together, or in pearly tears. This salt may likewise be obtained by acting with oxalic acid on the product of the concentration of urine deprived of its salts.   It is evident that in this case the oxalic acid decomposes the lactate of urea naturally contained in the urine; this oxalate is to be concentrated and purified with animal charcoal and crystallized.

The *sulphate of urea* is procured by mixing 100 parts of oxalate of urea with 125 parts of pure silky sulphate of lime ; a small quantity of water is added, and heat applied for a few moments ; four or five volumes of alcohol of 36° is added, the liquid filtered and evaporated ; the residue is the sulphate of urea in granular or needle-shaped crystals, of a sharp and pun-

gent taste.   The sulphuric acid may be separated by baryta,
and the urea re-obtained by absolute alcohol.   This salt has
not been previously described.

   If the lactate of urea is to be obtained by double decompo-
sition from an oxalate of that base, this latter is to be first dis-
solved in a little distilled water, then an aqueous solution of the
lactate of lime is cautiously added, so that neither salt shall pre-
dominate.   The solution is filtered and evaporated at a moderate
heat, or still better, in vacuo, when the lactate of urea will not
fail to crystallize.   If the sulphate of urea and lactate of bary-
ta are used, analogous results will be obtained.   It only re-
mains to re-dissolve the crystals and purify them by re-crys-
tallization.

   The lactate of urea, as it exists naturally in human urine, is
of difficult isolation ; on the one hand, on account of the excess
of lactic acid contained in the organic liquid, and on the other,
on account of the great solubility of this salt, which requires
an advanced state of concentration for its crystallization ; and,
finally, on account of its extreme volatility, which requires
that this concentration should be made with the greatest amount
of care.

   To ascertain the mean amount in which this salt exists in
urine, we evaporated a killogramme of healthy urine, made
during night, to the consistence of a very clear syrup ; it pro-
duced a deposit of white and confused salt, which was separat-
ed by the filter.   The liquid was shaken with carbonate of po-
tassa, to separate any excess of acid, and evaporated again un-
til a saline product began to appear, which, on cooling, became
very abundant.   The whole was then put in contact with a
mixture of two parts of alcohol of 33°, and one part of ether.
This was heated moderately, frequently shaken during three
days, and then filtered.   The ethereal liquid, on being dis-
tilled, left behind, as a residue, 18 grammes of lactate of
urea, crystallized in prismatic needles of a slightly yellow
color.

   This proportion of lactate obtained, does not represent the
whole amount of the urea ; a similar quantity of healthy urine

should furnish 27, (or 30 for 1000,) which circumstance confirms us in the idea that a large part of the lactate is volatillized by concentration.

Lactate of urea, either natural or artificial, crystallizes in elongated, six-sided prisms, with oblique terminations. These crystals are white, hygrometric, very deliquescent ; their taste is sharp and pungent ; they are very soluble in water, in alcohol of 38°, in etherized alcohol, but much less in pure ether. Heated moderately, they first fuse, then volatillize without decomposition, and then sublime. If the temperature be raised, a black, carbonaceous residue is left behind.

When the lactate of urea is heated with hydrate of zinc, and the product treated with absolute alcohol, the urea is separated, and the residue, insoluble in alcohol, on being dissolved in boiling water, will furnish crystals of lactate of zinc.

This new mode of obtaining urea, it appears to us, should supersede that which consists in previously converting it into a nitrate. To convince us of this, we treated the same quantity of urine, 1, by nitric acid and the usual means ; 2, by slacked lime ; 3, by hydrate of zinc. In the three cases, the quantity of urea obtained was nearly the same ; nevertheless, by nitric acid, there are more chances of loss, through the easy decomposition of the nitrate by heat ; by lime, a product was obtained, which it was difficult to purify ; whilst, by hydrate of zinc, the manipulations are easy, and the lactate of zinc may be used to prepare lactic acid, or other lactates.

The lactate of urea is formed, in the 100 parts, of

Dry urea, - - - - - - - 49.61
Lactic acid, (as it exists in saline combination) -   50.31

This composition represents in atoms :

Lactic acid, supposed to be anhydrous, 1 atom.
Urea - - - - - - 1 "
Water - - - - - - 1 "

Which leads to the following formula

$$C^2H^3N^4O^2+C^6H^4O^4+OH$$
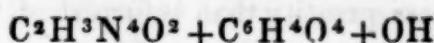
The natural lactate of urea, obtained from urine, presents exactly similar qualities with the same salt artificially prepared.

III. We have succeeded in obtaining many other salts of urea by the mode of double decomposition, which has answered so well in the case of the lactate of this base. These salts, which have not been previously described, crystallize with great facility, and possess well characterized chemical and physical properties ; such are the sulphate, phosphate, hydrochlorate, acetate, tartrate, and quinate of urea, with several others. They are, for the most part, to be obtained by treating the oxalate of urea, by means of different salts of lime and alcohol. Many of them are volatile at a moderate, and decomposable at a higher temperature ; all are soluble in water and alcohol. When treated with lime, baryta, or oxide of silver, and the mixture agitated in alcohol, this menstruum separates crystallizable urea, and forms a salt with the base, lime, baryta, or silver. The salts of urea, exposed to the action of nitric acid in excess, furnish a supernitrate of urea.

These different properties suffice to distinguish them from ammoniacal compounds, from which they also differ by other characters.

We will here remark upon the ordinary process for obtaining urea. According to this, after separating foreign salts and again evaporating, the liquid is *allowed to become cold*, and nitric acid then added. If the evaporation is pushed to a convenient extent, the nitrate of urea becomes a mass of small pearly crystals, of a gray or rose color. These crystals are drained, and the mother waters, separated and evaporated, furnish a new crop ; but all these crystals are purified with difficulty. We have remarked that if, in place of adding the nitric acid to *cold* concentrated urine, it be poured into *hot* weak urine, a slight reaction takes place, from which results, not a mass of

colored plates, but white plates of the supernitrate, completely pure, and not in less quantity than is furnished, with more trouble, by the former modes. We would hence conclude that the precaution of cooling the mixture has no advantage; on the contrary, by acting with heat, a nitrate is obtained, from which pure urea is separated with greater facility. To ascertain whether this mode effected any sensible alteration in the organic base, we converted two grammes of dry urea into supernitrate, with the assistance of moderate heat. After evaporating almost to dryness, the salt was treated with carbonate of potassa, and then by cold alcohol of 38°, which extracted a weight of urea equal to 1.89; a slight loss well compensated by the extreme simplicity of the new mode of extracting this base.

The researches of which we have presented the results, are but the first part of the labor to which we have applied ourselves, and which has for its object the therapeutic action of lactic acid, the lactates and salts of urea. For the present, we have arrived at the following conclusions :

1. Urea does not exist in a free state in urine.

2. In man, this base is combined principally with lactic acid ; in the ruminants, with hippuric acid ; in serpents and birds, with uric acid, or, at least, a peculiar acid which, according to M. Liebig, is its radical.

3. The natural lactate of urea, extracted from human urine, is identical with that prepared artificially.

4. The salts of urea are readily obtained by double decomposition.

5. Finally, the properties of lactic acid would lead us to the hope of finding, in the lactates, new and powerful therapeutic remedies.

The continuation of these researches will have for its object the means of obtaining, readily and abundantly, the lactic acid, and its combinations for physiological and medical experiment.

Journ. de Pharm.

ART. XXVII.—NOTE ON THE STONY SUBSTANCE USED IN CHINA IN TIMES OF FAMINE, UNDER THE NAME OF FLOUR OF STONE. By M. Biot.

THE details communicated to the Academy, by M. de Humboldt, on the existence of a stony substance which is sometimes used in Laponia in the times of scarcity, has called to mind a similar fact, an account of which has recently arrived from China, and is reported in the Missionary Correspondence. My son having also found the same fact attested for many ages in the Japanese Encyclopedia, with the dates annexed, I have engaged him to translate the passages which are there reported ; and I think that the Academy will be interested in the collection of the documents on a practice which is in reality more extensive than has been believed.

" The Japanese Encyclopedia, book 61, relative to stones and minerals, contains an article entitled *Chimien*, or *stone flour*. The following is the translation, in which will be found the same superstitious ideas as those given by Humboldt for Laponia."

The *Pen-tsao-kang-mon** says, " Stone flour is not an ordinary production ; it is a miraculous substance. Some say that it grows in times of famine. Under the Emperor Hien-Tsong, of the dynasty of Tang, in the period *Tien-pao*, third

* This is a collection of Chinese natural history, compiled towards the year 1575 of the Christian era, from the most ancient works. M. S. Julien has exhibited to my son the copy of the Pen-tsao-kang-mon, which he has ; the quotation made in the Japanese Encyclopedia has been verified with the original text, and found to be exact. This text gives, besides, the names of the districts where the stone flour is found. Many form part of the northern province of Chan-si, where the cold of winter is often very intense; others appertain to the maratime provinces of Chan-long, Kian-Nan, near the mouth of the Yellow river, where inundations are frequent. The provinces of Hon-Kouang and of Kiang-Si, for which the missionaries attest the same fact, are different from these, and are situated in the valley of the Blue river.

year, (744 of the Christian era,) a miraculous fountain sprung from the ground, the stones decomposed and were changed into flour." This text is accompanied by a wood cut, which represents the fountain flowing in cascades and the stones dividing into threads ; but they are so incorrectly marked that we cannot assimilate them to any mineralogical formation.

Under the emperor Hian-Tsong, of the same dynasty, in the period *Yuen-ho*, fourth year, (A. D. 809,) the stones decomposed and became flour. Under the emperor Tching-Tsong, of the dynasty of Soung, period Tsiang-fou, fifth year, (A. D. 1012,) there was produced, from stone, a substance like flour. Under Jin-Tsong, period *Kia-yeou*, seventh year, (1062,) stone flour was produced or grew. Under Tchi-Tsong, period *Yuen-fong*, third year, (1080,) the stones were decomposed and became flour. Every kind of stone flour was gathered and eaten by the poor.

The following is what is written in 1834 by the missionary in China, M. Mathieu-Ly, established in the province of Kiang-si.* The facts which he describes are reported for 1834, and the three preceding years, so that they coincide with those cited by M. Retzins for Laponia.

" Many of us Christians would certainly have died of famine this year. God alone could have relieved such extensive want ; the whole harvest had been carried off by the overflow of the rivers. For three years an infinite number of persons were sustained by the bark of certain species of trees which are found in this country ; others ate a light earth of a white color, which had been discovered in the mountains. This earth was worth its weight in silver, and all could not procure it. The people at first sold their wives, their sons, and daughters, afterwards their household utensils and moveables, and finally demolished their houses to sell the materials thereof."

Another missionary, M. Rameur, writing from the province Hon-Kouang, in the middle of the year 1834, gives no less deplorable details.

* Ann. de la Propag. de la Fois., Sep. 1836.

" The district Fan-Hien," says he, " contains about a thousand Christians; but they have been horribly decimated by famine. I have seen a great number come to demand the last sacrament ; they had calculated their resources, and knew the number of days they had to live. They received the sacrament of extreme unction, when they had exhausted their means, and then calmly awaited the moment of their decease."

To understand the occurrence of such calamities, and their frequent return in a society so laborious, devoted to agriculture and regularly governed for many ages, it must be recollected that many provinces of China, of greater extent than one-half of France, consist of level plains, traversed by large rivers, of which the bed is continually rising by the abundant deposit from the waters, so that they are compelled to restrain them by elevated dikes, kept in repair by immense labor. The provinces of Hon-Kouang and Kiang-Si, for example, of which mention has been made, are thus traversed by the Blue, and other large rivers.

These circumstances, giving every facility for irrigation, develope an extremely active state of agriculture, of which the bountiful produce is rice, which is cultivated on the undulations of hills, whence the water is carried by means of machines. As long as this state of things lasts, there is produced an immense quantity of necessaries, which likewise gives rise to correspondent increase of population ; but when the waters increase so as to overflow the dikes, it pours down upon the plain, inundates it, and swallows a part of the population ; then those who escape from this disaster find themselves ruined and deprived of every resource, inasmuch as the land is covered by the waters, and remain a prey to all the miseries which the missionaries describe, and finally die of starvation. This cause, joined to other catastrophes produced by earthquakes, which appear to be more frequent, more violent, and, especially, more extensive in China than in many other regions of the globe, instruct us, in a great part, as to the sudden vicissitudes which Chinese history attests to have recurred many times

among the population of this vast empire; vicissitudes which bear no proportion to the regular laws of European population, as may be seen in an account published in the Journal of the Asiatic Society, and of which I present a copy to the Academy on behalf of the author.*

Am. de Chim. et de Phys.

ART. XXVIII.—FATAL EFFECTS FROM ACETATE OF LEAD GIVEN IN LARGE AMOUNT FOR PHTHISIS PULMONALIS. By Dr. Bicking, of Mulhouse.

Although we possess a large number of observations in which the acetate of lead has been given with success, or, at least, without serious accident, for phthisis pulmonalis, there are others in which troublesome results have followed from the prolonged use of this medicine, and, on this point, Dr. Bicking cites the following case:

Ferdinand R———, aged fifteen years, subject, during his younger days, to attacks of scrofula, suffered several times from affections of the chest, and finally became consumptive. Having arrived at an advanced stage of this affection of the lungs, accompanied with hectic fever, sweats, and colliquative diarrhœa, without any remedy having power to arrest or alleviate its course, Dr. Bicking commenced with the use of acetate of lead.

I gave, says he, to the patient, a quarter of a grain of acetate of lead reduced to powder, along with sugar of milk, four times a day, during a certain time. Under its influence, I obtained a marked amendment in the course of the morbid symptoms; the fever, the sweats, the dejections, and cough dimi-

* Account of the population of China and its variations, since the year 2400 before the Christian era, to the third century after. By Edward Biot.

POISONING BY ACETATE OF LEAD.

nished. The purulent expectoration likewise diminished, without any increase of oppression ; this advantageous result induced me to continue the treatment, and, during six weeks, I successively increased the dose of the medicine, so that at the end of this time the patient took two grains of the acetate of lead during the day.

At this period, the patient experienced a marked relief, troubled from time to time with some returns of the same general symptoms from which he had been relieved, and, at each return, I employed, with success, the same means. In twelve weeks every trace of phthisis had disappeared, and the child, who returned to school, was no longer subject to medical treatment. He had taken, in the course of the disease, nearly an hundred and thirty grains of acetate of lead, without any poisonous or even hurtful effect.

In the meantime, he could not regain, entirely, his health ; his strength declined, he became thin and pale, and his pulse frequent ; frequent difficulty of respiration, pains in the chest, and an obstinate cough of irritation. I was apprehensive of an immediate renewal of the consumptive attacks. My fears were realized, but in another manner.

One month after the appetite gradually failed, the hypochondrium became affected with painful spasms ; the stools were rare and painful ; the skin over the whole body became blueish ; the countenance became puffed up and hot, the hair fell out ; soon a convulsive cough supervened, accompanied by great difficulty of respiration, and burning pains in the chest, to which succeeded partial paralysis of the feet. This state remained fourteen days. One evening he experienced a violent access of fever, with heaviness of the head, paralysis of the eyelids, and convulsions in the face and extremities.

All remedies were unavailable ; the patient remained insensible, in stupor or delirium ; he died the third day after, but no autopsy was made.—C. W. *Hufelands Journ. des Pract. Heilk.* 1839.

The publication of this notice should not, however, lead to

the belief that the medicinal use of acetate of lead is always followed by fatal effects. We believe that it is necessary to study the therapeutic action of this acetate; we know that large quantities of this salt have been taken, in several cases, and we have seen Dr. Bricheteau treat, with pills of acetate of lead, Mademoiselle C—— S——, who was considered to be affected with consumption. This treatment was followed by great success, and the lady is now married, and has several children, and enjoys a good state of health.   A. C.

Journ. de Chim. Med.

The above case is one of those rare occurrences in which a remedy, in many cases of great advantage, has been followed by lamentable consequences from its prolonged use. It may be advantageous to enquire to what cause such effects may be owing. In addition to the observations in the note of M. A. Chevallier, it may be asked, may not this effect arise from the formation of a carbonate of lead in the stomach of a patient whose digestive organs are much debilitated ? Although pure neutral acetate of lead is not affected by free carbonic acid, nevertheless the acetate of the shops is always more or less affected by the presence of this gas, solutions always being cloudy when not made with distilled water. This is due to the loss of a portion of acetic acid, consequent on the exposure of the crystals to the air. This exposure is followed by an opacity of the external crystals by efflorescence, but that, in this instance, the result is not entirely owing to the loss of water of crystallization may be concluded from the strong smell of acetic acid which is exhaled by a jar of acetate of lead when recently unstopped. In this country, the acetate is commonly used in much larger doses than is here stated : a very common prescription, especially in dysentery, cholera morbus, &c., being two or three grains of the acetate frequently repeated, and it is rare indeed to hear of any injurious effects therefrom. The custom, however, here, is to unite, in the same prescription, a greater or lesser quantity of opium, as a means of obviating any injurious effects of the remedy, as well as to fulfil other

indications in the above diseases. That it may have this tendency, will be obvious in considering the reactions which will be consequent on the mixture of these two ingredients. The meconic acid of the bimeconate of morphia would first neutralize any excess of oxide of lead in the acetate, and then the remainder would unite with more of the lead, and liberate acetic acid, thus forming an insoluble meconate of lead, which would pass through the intestines and be discharged. This remedy, however, is not employed to the same extent here in chronic cases, where a long continued use is required to produce its full effect, as it is in Germany. In this latter country it is very highly recommended in consumptive affections, and effects may result from its prolonged use, which would not appear from a greater amount of the remedy given in a much shorter time. R. B.

ART. XXIX.—ON THE TRANSFORMATION OF CALOMEL INTO CORROSIVE SUBLIMATE. By M. MIALHE.

I HAVE the honor to communicate to the Society of Pharmacy, the summary of some experiments which I have made on the transformation of calomel into corrosive sublimate, experiments which I was suddenly forced to interrupt.

The point from which I started with my researches, was the following fact, reported by Vogel. A physician prescribed for a child twelve papers, each containing five grains of sal ammoniac, five grains of sugar, and half a grain of calomel : the child having died after taking several of the powders, the apothecary was accused of having committed an error in compounding the prescription. Luckily for our colleague, the accusation which hung over him was of short duration, Peter Koffer having quickly proven that, in presence

of sal ammoniac and of water, calomel is partially changed in-
to corrosive sublimate.   This fact, of which I have ascertained
the exactness, has always appeared to me very remarka-
ble, and well worthy of fixing the attention of physicians and
physiologists.   It would not be so, if the assertion of one of
the most distinguished professors of our school were founded
in fact.   This professor asserts to have proven, by means of
experiment, that the chemical change of protochloride of mer-
cury into deutochloride, does not take place under the circum-
stances stated by the German chemist.   I shall not attempt to
point out whence is the source of the error into which our
learned colleague has fallen ; I shall at present content my-
self with publishing the conclusions which result from my ex-
periments.

1. The protochloride of mercury, in presence of hydrochlo-
rate of ammonia, or of the chlorides of sodium or potassium,
and of pure distilled water, is changed partly into deutochlo-
ride of mercury, and into metallic mercury.   This change
takes place at the temperature of the human body, and even at
common temperatures, and demands but few moments of con-
tact to be effective.   It is sufficient, for example, to be con-
vinced of this fact, to allow calomel to remain a few minutes
in the mouth ; a mercurial taste, of sufficient intensity, will not
be slow in exhibiting itself.   This taste is the result of the mu-
tual reaction of the chloride of mercury, and the alkaline chlo-
rides in the saliva.

2. It is to the change of calomel into corrosive sublimate,
and metallic mercury under the influence of sea-salt and the
salts of ammonia, which we know exist in the liquids of the
alimentary canal, that we must attribute the pathological phe-
nomena of mercurial salivation, from the administration of ca-
lomel.   What proves that this is really the case, is, that, when
the protochloride of mercury does not purge, but is retained
for a long time in the digestive tube, it excites an unu-
sual secretion from the salivary glands, and this on ac-
count of the large quantity of corrosive sublimate which is

produced.　The same phenomena happens after the long continued use of the protochloride of mercury, and from the same cause.

3. As the quantity of corrosive sublimate formed can only be proportional to the amount of alkaline chlorides which are contained in the viscera, those persons who eat large quantities of common salt, every thing else being equal, should be more susceptible than others, when under a mercurial course of medicine.

4. The antisyphilitic properties are communicated to it, either in whole or in part, by the sublimate and the mercury to which its chemical decomposition gives rise.　It is, without doubt, the same as regards its anthelmintic virtues; it is by producing poisonous effects on the ascarides, by means of the two agents mentioned, that the mercurial chloride relieves us from these importunate guests.

5. All that has been said of the medicinal action of calomel, may likewise be predicated of the prot-iodide of mercury, which, under the same circumstances, is converted into deutiodide.

Journ. de Pharm.

ART. XXX.—ON THE ACTION OF THE METALLIC SALTS ON ALBUMEN AND ON ANIMAL TISSUES. By J. L. LAS-SAIGNE.

Extract.

CHEMISTS have stated that most metallic solutions precipitate albumen.   This action has by many chemists been ascribed to the decomposition of these salts, and the union of the oxide with the organic body.   No positive experiments having as yet been made to confirm this opinion, the author of this paper has undertaken a series of experiments, of which the results establish, contrary to the received opinion, that, in the action of albumen upon metallic salts, this principle unites directly with these compounds without producing any decomposition.   The examination of the resulting combinations has shown that they possess properties, of which the most essential are exhibited under the following conclusions :

1. Albumen, as the experiments related in the paper of M. Lassaigne demonstrate, has the property of uniting with metallic salts without decomposing them, and produces with them compounds which are insoluble in water, when these bodies are in certain proportions, but susceptible of solution when the albumen or the metallic salt is in excess.

2. These compounds, which may be called *albuminates*, appear to result from the action of four or six atoms of albumen upon one atom of the metallic salt, as is indicated by the analysis of the combinations which have been examined in these experiments.

3. These combinations, when hydrated, possess the singular property of dissolving in many of the alkaline salts, which are capable of decomposing the metallic salts of the compound when not united to the albumen.

4. It is probable that, when administered internally, the metallic salts, in consequence of their absorption, form analogous compounds, either by union with the albumen contained

in the fluids, or with the tissues of our organs, and that in this state it is then carried into the system, and produces there its medicinal effects.

5. It is therefore interesting for therapeutics to examine the effects which albuminous compounds with metallic salts have upon the animal economy.

5. In the action of a metallic salt upon any tissue, there is at once established a combination between these two bodies, which, modifying the vital properties of this organic part, produces a change in its functions.

The metallic salts, in their relation with soluble albumen and the organic tissues, act similarly to the bichloride of mercury, as has been already stated. These new facts serve to generalise the known chemical action of the bichloride of mercury upon albumen and the organic tissues.

Journ. de Chim. Med.

MISCELLANY.

Case of Poisoning by the Essential Oil of Bitter Almonds, observed by M. CHAVASSE.—M——, druggist, had placed a bottle of the essential oil of bitter almonds in a closet, without labelling it; along side was another bottle, also not labelled, containing sweet spirits of nitre. In the meantime his health was good, with the exception of occasional suffering from nephritic pains. While suffering from a smart attack of this complaint, he went in a hurry to the bottle of sweet spirits of nitre, and swallowed, at one draught, the amount of half an ounce; but, by mistake, he had inadvertently taken the bottle of oil of almonds, in place of the other. Immediately discovering his error, he sent for a physician. In half a minute after, he became pale, fainted, and was convulsed; his countenance became deathly pale and his pulse imperceptible.

M. Chavasse quickly arrived; he found the patient on a bed. The syncope had gone off in a few minutes after he had lain down; he immediately vomited much alimentary matter and bile, smelling strongly of prussic acid. Deadly palor, general coldness, a pulse at first small, frequent, intermittent, then small and regular; sub-delirium, incoherent muttering, convulsive movements, especially of the eyebrows; then sardonic laughter, gay appearance and brilliancy of the eyes, short and panting respiration, attacks of suffocation, and accessions of convulsions were successively exhibited by the patient. M. Chavasse looked for a stomach pump, but not finding any, he vomited the patient by hot water and sulphate of zinc, which he gave to the amount of three gros. He at the same time endeavored to restore the temperature of the body by means of bottles of hot water and hot cloths; but he did not lose sight of the most essential point, after vomiting, the administration of stimulating remedies. He gave to the patient a mixture of brandy and ammonia, diluted with water. The amendment was immediate; the pulse, the temperature, and the functional action were gradually relieved, and the patient passed from death to life.

The following draught was continued: Ammonia, 1 gros.; tinct. cardamom, 1 ounce; mist. camph., 7 ounces; and the patient recovered.

Journ. de Chem. Med.

Poisoning in rabbits by large doses of Sulphate of Quinine. By M. DESIDERIO.—The author, in a paper written in Italian, makes known the results of nine experiments in which he gave rabbits the sulphate of quinine,

either alone or united with other substances. In the two first experiments, 40 grains given to adult animals produced death in less than five hours. A young rabbit was killed in six hours by fifteen grains. In the other experiments the author associated with the action of the sulphate of quinine, that of alcohol weakened with water of canella, that of distilled water of the *Laurus cerasus*, and, finally, that of opium.

Journ. de Chem. Med.

Poisoning by Aconite.—It is well known that the *Aconitum napella* is a violent poison. Matthiole, Pallas, and other authors have related cases of poisoning by this vegetable, which is found extensively in our gardens as an ornament. Here is another example of the danger of this plant.

At Suippes, (Marne,) a young child, aged twenty-one months, in full health, was taken into the garden by her mother, who stopped along side of a very poisonous plant, the *Aconitum napella*, commonly known as monkshood. The child pulled some leaves and two or three flowers which she swallowed. Her mother, attracted by something else, immediately on perceiving it, although entirely ignorant of the dangerous properties of the plant, took it from her hands and threw it away. Unfortunately it was too late; at the end of half an hour the child began to stagger, its appearance became animated, and it was soon unable to stand. At first, the parents supposing that she had drank some wine at a neighbor's, were not alarmed. Nevertheless, as these symptoms increased more and more, and the little patient complained continually of pain in the stomach, they called a physician, about two hours after the first manifestation of the complaint. This person immediately recognising in the child the symptoms of poisoning, hastened to administer, as an antidote, some spoonfuls of an emetic draught, which immediately produced vomiting, but the aid was unfortunately too late; at the time the physician caused the child to take some more of the same draught, he perceived the eyelids convulsed and the jaws to be set, the body to become rigid and bent back, and the limbs to be convulsed. Five minutes after the child was dead.

Journ. de Chim. Med.

Sublimed Benzoic Acid. By Fr. Mohr.[*]—The new French Pharmacopœia directs that benzoin should be mixed with its weight of fine sand, before it is introduced into the vessel, and recommends that the vessel should be shallow, and covered by an unglazed vessel, somewhat resembling an inverted flower-pot. The addition of sand is neither necessary or advantageous; its use, on the contrary, gives rise more readily to empyreumatic products, and at an indeterminate degree, for in it are united all the conditions necessary for the production of the colored oil. After ma-

[*] Annal. der Pharm. vol. xxix, cap. 2.

ny experiments, the following process has been recognised as free from all fault: the lower vessel is a circular and flat casting, of the diameter of eight or nine inches, and the sides two inches in height. A vessel of iron answers the purpose very well. About one pound or less of coarsely broken benzoin is to be strewed regularly over the bottom. Over the opening of the pot, unsized paper of a loose tissue is to be stretched, and fastened to the sides by paste; a cap of thick wrapping paper is to be placed over the whole, and adapted very accurately to the sides of the vessel, so that there may be no opening; this is then to be strongly tied to the base. The most certain mode to obtain a uniform application of heat is to place a large metallic plate on a tripod, to pour upon it some sand, and to fix solidly the subliming apparatus thereon; a slow charcoal fire is to be applied beneath the plate and kept up for three or four hours, keeping in mind that the beauty of the product depends on the regularity of the heat, and the slowness of the operation. The plate, placed under the apparatus, serves not only to spread the heat, but prevents the ascending current from the fire from striking the paper cap. When the operation is terminated, the apparatus is to be allowed to cool completely, to be then inverted, and the cord detached; extremely beautiful flowers of benzoin will then be found in the cap. A cap of the size and form of an ordinary hat for the human head, is preferable to a cone of paper. The essential advantages of this method consist in the unsized paper stretched over the vessel, and through which the vapors of benzoic acid are compelled to pass. I am convinced that it is not necessary to perforate the paper with holes, but that the loose tissue suffices for the transmission of the vapors. The flowers of benzoin deposit, almost completely, their fetid coloring oil during their passage. They exhibit a brilliant white appearance, and exhale a strong and agreeable odor of benzoin, and the paper is strongly colored by the empyreumatic oil. The paper likewise prevents the sublimed flowers from falling back into the cake of benzoin, without which there would be a constant re-sublimation of the flowers, and, finally, a decomposition; the paper finally prevents the condensed benzoin from being affected by the radiant heat from the bottom of the vessel; so that the condensation takes place with greater facility, and, for this reason also, there should be no opening in the paper cap. The French pharmacopœia says the fire should be regulated by the disengagement of the vapors; this care is here superfluous; a slightly elevated temperature does no harm; because the paper cap is always cooled on its exterior, and constantly protected against the heat from the bottom of the vessel. The product of sublimed flowers is always less than by Scheele's method; there is commonly obtained 4 p. 100 precisely, as the French Pharmacopœia points out.   A. G. V.

Journ. de Pharm.

On the presence and extraction of *Carbonate of Soda in Hungary.* By A. WERNER. (Journ. per Practic Chem.)—The localities most abounding in

carbonate of soda are in Little Cumania, especially in the neighborhood of the town of Shegedin, where there already exists five establishments for its extraction; and in the county of Bicharer, in the neighborhood of Maria Theresiapel. This salt, which is called *székso* in the language of that country, effloresces from the ground in damp places, where it covers the surface with a crust as white as snow. The season most advantageous for its collection is the spring, after the clear nights which have produced much frost and before sunrise. The soil is considered to be less rich after the rise of that luminary. The collection may also be made in summer and fall under the same circumstances.

The soil, which is of a grayish white, being swept into heaps, is bought by the manufacturer. Its value is tested solely by its taste. It is then washed in square tubs, until the taste no longer indicates the presence of saline matter; these weak solutions are then turned anew on fresh portions of soil. The liquor, which is of a deep brown, contains, besides the carbonate, both sulphate and muriate of soda, with ulmates and other impurities; it is evaporated to a syrupy consistence in a large vessel made of strong iron plates; it is then conveyed to another evaporating vessel, likewise of iron plates, placed near the first, and in this it is evaporated to dryness. The resulting mass is calcined in a large furnace until empyreumatic vapors cease to be given off, and then fused at a red heat; when half cooled, it is withdrawn from the vessel. When completely cold, the soda is white, and is now broken in pieces; it is employed in that country for the manufacture of soup, and likewise exported as crude soda.

A. G. V.
Journ. de Pharm.

An examination of an animal coloring powder called Syria. By J. J. Virey.—There is imported from London a powder of a very deep violet reddish-brown color, pretty heavy, inodorous and insipid, but tinging the saliva of a beautiful carmine red. This powder is dense, and little volatile; it communicates, almost instantly, either to water or alcohol, a beautiful purple tint, deep and solid. Nitric, acetic acids, &c., brighten it, by giving to it a reddish shade, which resumes, however, in the air, a more violaceous tint.

It was a question with us to determine the nature of this product; placed upon a sheet of red hot iron, this powder gave off thick white vapors, of an animal character, and only left a puffy charcoal, difficult to incinerate. This character thus evinces the essential animal nature of the substance. It was then proper to inquire in what order of animal substances could be found the source of this carmine red powder.

We had thought that, as there was collected in the East, especially in Asia Minor and the whole of the Levant, a large quantity of the *Kermes animal, Coccus ilicis,* all that had been done was to separate the purple

juice, so rich in the *coccine* of Lassaigne, which is analogous to the *carmine* of Pelletier, and obtained from the entire cochineal. But it is known that after the expression of the juice of the Kermes, for tinctures, for syrups, or the exciting liquors so much used in the East, (l'Alkermès) the residue, the debris of these gall insects, contain a semi-corneous envelope, and other dry organs, connected with matter nearly useless. The greater part of these remains, in fact, is composed of the corneous substance, common to most insects and called *chitine,* with some mineral salts, (phosphate and carbonate of lime,) which ordinarily accompany it.

But it was easily shown that these debris still contain a notable quantity of coccine, the red coloring matter.

It was only necessary to submit this dry residue of Kermes to porphyrisation, and to give an eastern name to the substance to increase its value, to disguise it under the title of *syria,* syrian powder.

Further, it is evident that there can be obtained a sufficiently large quantity of purple coloring powder, and a pigment more or less solid of this powder, but we have not observed it with the vivid, brilliant, and pure tints, which the carmine of cochineal or its magnificent preparations present, yet it is probable that a useful application of syria may be made in the art of dyeing, and to color either papers or tissues, and a multitude of substances in daily use.

Journ. de Pharm.

ADDITIONAL NOTE.—It has been suspected that the *lac-lake* or lac-dye enters into this coloring powder, because both present equally a purple color. But the specimens of lac-dye, in violet reddish-brown cubic cakes, such as have been described by us in the *Journal de Pharmacie* for 1821, tome vii, pages 523-4, at the termination of our memoir upon lac resin, are not completely incinerable by fire, like the powder of syria. Besides, lac-dye contains also a portion of friable magnesian talk, which has received the color so as to be employed in water colors, which is not the case with the syria; it affords no earthy parts and gives no effervescence with acids as I have determined. It has, nevertheless, a specific gravity greater than lac-dyes; for the latter retains a portion of lac resin, suspended in the caseum of milk by aid of soda, then precipitated by citric acid. On the contrary, the powder of syria, equally soluble, as regards its coloring portion, in water and alcohol, does not contain an abundant resin, like the lac. Such are the differences between these coloring matters.